FIELD MUSEUM OF NATURAL HISTORY BULLETIN

January 1987

Gods, Spirits and People

The Human Image in Traditional Art

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Field Museum
of Natural History
Bulletin

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COVER

Headdress figure from Western Cameroon or Eastern Nigeria, late 19th century. It may currently be seen in the exhibit "Gods, Spirits, and People," which went on view at Field Museum November 22. This skin-covered wooden figure was worn on top of the head as part of a cloth face mask. The skin is antelope, but it is said that in the past human skin was used. Although the figure represents a woman with an elaborate hairdo, it was worn by men of the Ekpo Society, who exercised social control and supervised the village's sanitary conditions. The figure symbolizes a female ancestor and the vital forces of the community. Made by the Ekoi tribe of the Cross River area. Schroeder collector, cat. 175615. height 28". Photo by Ron Testa and Diane Alexander White. 109446.

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Events

The perfect couch, these boys will tell you, is a dinosaur leg bone in Stanley Field Hall.
79329

Winter Fun 1987

DRIVE AWAY DOLDRUMS! Treat your children (or grandchildren) to weekend workshops at Field Museum. Workshops begin January 17 through February 15. Children ages 4-13 can participate in classes that range in topics from alligators, birds and artic whales, to the fascinating cultures of the Pawnee and Hopi Indians.

Highlights of workshops being offered this year are: "Sharks Teeth, Crab Claws, and Sea Shells"; "Nests, Roosts, Hollows, and Holes," for 4- and 5-year-olds; "Earthq-q-u-u-ake!" for 6-7 and 8-9-year-olds; and "Fossils" for 10-13-year-olds.

Anthropologists, paleontologists, artists, and writers bring their creative energies and expertise to this winter's workshops. Advance registration required. See the *Winter Fun* brochure for a complete schedule and registration form or call 322-8854, Monday-Friday, 9:00am-4:00pm for further information.

January Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the *Weekend Programs* sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

January

4 11:30am *Geology of the Chicago Area* (tour). Discover what's beneath the surface of the Chicago area.

10 11:30am *Ancient Egypt* (tour). Explore the traditions of ancient Egypt from everyday life to myths and mummies.

11 2:00pm *Malvina Hoffman-Portraits in Bronze* (slide lecture). Explore the life and works of famed sculptor Malvina Hoffman, concentrating on the "Portraits of Mankind" Collection

18 1:00pm *Welcome to the Field* (tour). Enjoy a sampling of our most significant exhibits as you explore the scope of Field Museum

25 11:30am *Geology of the Chicago Area* (tour). Discover what's beneath the surface of the Chicago area.

84604-2

84573-6

THE *Treasures Ball*

A ONE-NIGHT EXHIBIT in Grainger Gallery of some of Field Museum's most treasured specimens was also the occasion for a gala black tie dinner dance in Stanley Field Hall. Sponsored by the Museum's Women's Board, the memorable event took place on Friday, November 7. Mrs. Robert C. Ferris was chairman of the gala; vice-chairmen were Mrs. Donald C. Greaves and Mrs. John L. Hines. Music was provided by the Bob Hardwicke Orchestra and the affair was underwritten by Sara Lee Corporation.

Shown here are some of the evening's guests as they viewed the exhibit.

Photos by Diane Alexander White

84604-4

84604-3

Road to Paris

Chapter 22 of

IRANIAN ADVENTURE
The First Street Expedition

by William S. Street *and* Janice K. Street
with Richard Sawyer

Many couples approaching sixty and planning retirement might buy a camper and think about a little serious fishing. Bill and Jan Street bought two Travelalls, hired Doug Lay, a young mammalogist, and took off to scour the mountains, deserts, and river valleys of Iran for wildlife specimens to enrich Field Museum's collections. They started by hunting red sheep two miles high in the Elburz Mountains and went on from there. During the next six months, they travelled nearly 15,000 miles and collected nearly 3,500 mammals, from bears to bats. They also collected hundreds of birds, reptiles, amphibians, and fish, complete with thousands of fleas, ticks, and mites—all equally valuable for study. Thanks to their efforts, Field Museum now houses one of the world's finest collections of Iranian fauna.

But as history moved on, the Streets found that they had also captured a last view of an ancient culture on the brink of change. Their notes and photographs illuminate the vast political eruption that followed. This, and the lengthening roll of research papers based on their collections, gives lasting value to the Iranian adventures of three Americans who learned the scientific expedition business by doing it.

Chapter 4, "Doab," of Iranian Adventure *appeared in the October 1985* Bulletin. *"Road to Paris," on the following pages, concerns the final leg of the Street's seven-month adventure.*

After pitching our tents, we slept soundly that night. The weather turned cold, and we were reluctant to abandon the warmth of our sleeping bags the following morning. But we struck the tents, had a quick light breakfast, and were on our way. We wanted to get as close to Maku and the Turkish border as possible that day.

We reached Maku about six that evening and paused to pay our respects to Col. Pouremaglessi and his wife who had been extraordinarily kind to us on our first visit. Our memory of the ebullient Colonel had dimmed somewhat, and we had forgotten how complicated the most mundane arrangements could become under his enthusiastic direction.

When we stopped at the Pouremaglessis to say good-bye, they were preparing to join the Governor at a friend's house for a small gathering. The Colonel promptly informed us that he would call his friends to tell them to expect additional guests.

"Many thanks for asking us to join you," I told Pouremaglessi, "but it is really quite out of the question."

"But it is to be a party!" Pouremaglessi protested. "Just wait a few minutes until the Governor arrives, then we can all go together. No one will mind how you are dressed. They will understand."

Just then the Governor came bounding in, displaying his usual high spirits. He was delighted to see us. Between the Governor and Pouremaglessi we were, if not outnumbered, at least out-talked. We would not go to the party, but they would telephone ahead to the hotel at Bazergan, where we planned to spend the night, make our room reservations for us, then join us at the hotel for a late supper. Bazergan was at the border, only sixteen kilometers from Maku.

Even arrangements at the supper got very involved. We were fighting for the check before the meal had been served. I insisted that they were to be our guests; they insisted just as strongly that we were their guests. And all the while, the compliments were flying thick and fast

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between Pouremaglessi and me. The Colonel was determined not to be bested in vying for the role of host.

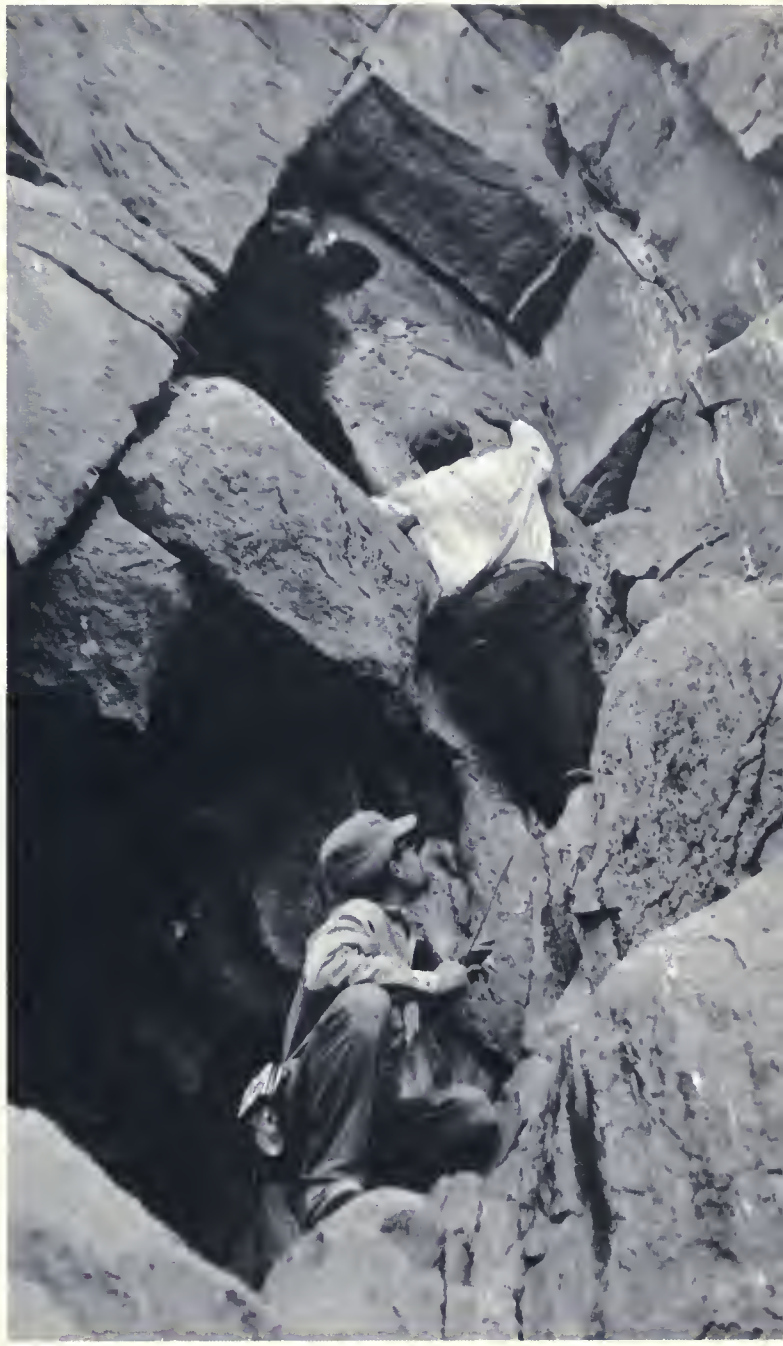
When I had been so insistent about their being our guests at a late supper, I did not know that the only hotel in Bazergan able to accommodate such an affair served only sandwiches, snacks, Pepsi-Cola, Canada Orange, and tea! As we parted we told the Governor and the Colonel that we would go on to the hotel, freshen up, and expect them to join us later. The Colonel sent a lieutenant with us to show us the way. Once there, Jan dug a not-too-wrinkled dress out of her luggage. Doug, Nicola, and I wore what we had on our backs. *

Dinner was to have been at eight o' clock, but the Colonel, the Governor, and their party didn't arrive until nearly ten. Knowing the shortcomings of the hotel, they had brought dinner with them. And what a feast it was! Soldiers appeared bearing platters, baskets, and hampers of food that they laid before us on a table in a private room reserved by the Colonel. The party had expanded, too. Instead of just the Colonel, his wife and the Governor, about six other men joined us—including customs officials whom we would see again the next day as we crossed the border into Turkey.

We sat down to tea and oranges, which were followed by rice and lamb kabobs, an omelette, a mountainous salad, and plates of vegetables and bread. It was all delicious, and we topped it all off with more oranges, tea, and Pepsi-Cola. Mrs. Pouremaglessi was quite animated that night and wanted to know if we had film for our Polaroid camera. She wanted to add more pictures to her memory book. Her disappointment was almost palpable when we told her that we'd been unable to buy Polaroid film in Tehran. Her depression was short-lived, however, as the festive spirit of the evening reasserted itself.

Just when I'd given up hope of ever seeing a bed again, the Colonel asked if we were tired. We admitted that we had had two long days of driving and faced the prospect of a tough drive the following day.

"We should like to stay all night and talk with you and be with you because we love you so dearly," he told us. "But perhaps we should let you go to bed." Mrs. Pouremaglessi came over to Jan, embraced her, and they kissed one another on both cheeks. Thus we parted with kind and generous people who will always be associated



Earlier, in northwestern Iran, expedition mammalogist Doug Lay bagged specimens of the tomb bat, a species new to Iran.

Jan: Janice K. Street; Doug: Douglas M. Lay, the expedition's mammalogist, then a doctoral candidate in zoology, now on the Faculty of the University of North Carolina; Nicola: Nicola Haroutounian, the expedition's driver-interpreter.

in our memories with some of the high points of our trip to Iran.

At the last minute, there was a flurry of Turkish bank notes in an exchange involving the Colonel, the Governor, the customs man, and one of the young lieutenants. I found myself holding Turkish money that had been given me in exchange for travelers' cheques. I am certain that the ease with which we crossed from Iran into Turkey the next day was somehow related to the small transaction of the night before. The Colonel, bless him, even instructed one of his lieutenants to remain in Bazergan to escort us over the border.

The glass lizard that got away. An Iranian university student, the owner of this unusual specimen, was unwilling to relinquish it to the Americans.

When we passed through customs the following morning, our luggage wasn't even inspected. The only item questioned was a small rug that Douglas had bought, and this had to be properly tagged. They examined our passports and processed us through Iranian customs as quickly as possible.

On the Turkish side of the boundary, life progressed at a more leisurely pace. It was 10:00 a.m. before the Turkish customs man was up and about. An English youth, who had been away from home a year and was eager to return, had been banging on the door of the customs house for an hour or more, and not a soul paid any attention to him. The more he pounded, the more relaxed the customs officials became. When the customs men finally came to life and let us through, we gave the young Englishman a ride for a hundred or so miles, before dropping him off at his request.

It was a beautiful day for driving. We hadn't gone more than thirty miles from the border when it began to snow. Mt. Ararat and the smaller surrounding mountains were so striking that we took a number of photographs. The country was rolling and bare of trees, but the miles of unbroken snow made a picture unmatched for primitive beauty. Douglas, reared in the American South, had never seen so much snow, and every time we stopped to take pictures, he and Nicola had a snowball fight.

In Turkey we were conscious of an all-pervasive military presence. Everywhere we looked we saw soldiers, military vehicles, or army encampments. Our first major city in Turkey, Erzurum, seemed to be just one big military installation. Soldiers were directing traffic and just before driving into town, we had seen other troop units undergoing special training, wearing snowshoes and white uniforms. They were holding what appeared to be winter maneuvers. We wondered how much of that costly military hardware had been purchased with U.S. aid.

That first night in Turkey we stayed in a so-so hotel and sought out a restaurant that served real Turkish meals, not food designed to please the palates of tourists. Finding an open restaurant was a bit of a task in itself, because we arrived during the Muhammadan month of Ramadan, in which the faithful fast each day from dawn until sunset. It was during this sacred period that we ran into a strange and frightening situation.

Driving through a small village a day or so later, we had to stop the car because the roadway was blocked by men and boys. In the middle of the road stood a man on a chair, leading a chant which was answered by the all-male crowd. They were members of a sect known as flagellants, people who scourge themselves as a public penance. These men and boys were in a frenzy of religious fervor, beating themselves about their backs and shoulders with chains attached to short wooden handles. Others were beating on their chests with closed

fists. Some with the chains had blood running freely down their bodies.

Our white-skinned faces and our foreign vehicle must have seemed to them an intrusion by infidels. It was a mean-looking crowd, and they viewed us with no kindness whatever.

"Nicola," I said, "just keep driving. Don't drive too slowly, and don't drive too fast. And don't look to the right or the left. Just keep driving. But don't stop for anything."

Bill and Jan Street in night hunting position atop the Travelall.

Safely past that encounter, we continued to be aware of the pervasive military presence in Turkey. We saw soldiers practicing driving trucks over hilly, rocky, muddy terrain and wondered what sort of duty they were preparing for. At times our road took us to elevations of 9,000 feet and there was lots of snow. The hills and mountains were treeless, and the expanse of seemingly endless white cover was almost unbelievable. It seemed to go on forever and ever.

From Jan's notes:

Wildflowers were in evidence at quite a high elevation. There were primroses growing all over—yellow, ivory, and purple. There were Christmas roses, and by the time we got through Turkey I had seen more Christmas roses than ever before in my life. Whole banks were covered with a tiny wild azalea and some violets. Closer to the Black Sea were rhododendrons, and some hillsides were solid masses of them. We saw only one in bloom that was like our wild lavender rhododendron, but it must be a glorious sight to drive through this area about six weeks later than this—it would be ablaze with color.

There were great bushes of white and sky-blue heather, some four or more feet in height. Iris were blooming, and we saw hazelnut trees. There was an abundance of water here, and it made us think how nice it would be to send some of the surplus back to Iran, which suffered such great water shortages in so many areas. And we also began to see orchards—some new and some obviously very old.

A strange thing happened on the road between Erzurum and Trabzon, on the coast of the Black Sea. During the planning stage of our expedition in Chicago, Dr. Reed had mentioned wolves and the Kurdish mastiff —immense dogs that guarded flocks of sheep. Dr. Reed had asked that we try to secure a skull of one of the mastiffs as well as specimens of the wolf. We had collected the wolf and seen the great mastiffs—in fact, we had come close to tangling with these fierce dogs a time or two. Frightened as we were at our several encounters with them, they were not the kind of animal that could be shot in the wild. To do so would destroy an important partner of the shepherds, and such an act would have been unthinkable unless a human life were in immediate danger. Moreover, in Iran or Turkey, it would have been literally worth your life to have killed one of those animals belonging to the Kurds.

We were driving along the road between villages when we came on two of these great mastiffs lying dead on the highway. We quickly stopped the car and backed up to examine these immense beasts more carefully. Although they had been struck by some vehicle, their skulls were intact and would make valuable specimens. We paused long enough to sever the two heads—and then wonder how on earth we were going to transport them. With four of us in the vehicle, the top racks were loaded with all the extra luggage we could carry and were tightly covered with tarpaulins to boot. The only thing we could do with those bloody heads was to tie them on top of the load, and pray that we didn't run into a caravan of Kurdish tribesmen.

Continued on p. 19

Gods, Spirits and People

The Human Image in Traditional Art

by Robert A. Feldman
Exhibit Developer and Research Associate in Anthropology

The Exhibit "Gods, Spirits, and People," which went on view on November 22, presents a small sampling of human images from Field Museum's collections of the traditional art of non-Western cultures. Images of people can be decorative or entertaining, but in traditional cultures these images more often carry important social meaning. They can teach children in the ways of their culture, heal or make one sick, honor the dead, control or police the actions of the living, and worship the gods.

A key aspect of any form of art is its communicative content. Art carries a meaning beyond (or even at odds with) its use in everyday activities. In many respects, art takes the place of a written language in nonliterate societies; thus, traditional art can serve to make manifest ideals or beliefs and "fix" them for transmission.

The human form is one of the most common images in art world-wide—if not the most common. Why is this so? Foremost must be that the artist is a human being, and shows his or her own kind. Beyond simply mirroring the body, however, the human form in art mirrors the society (the "body" politic). As a reflection of society, art expresses the concerns, desires, and fears of the people who made it.

A depiction of a human being can be invested with special symbolic content, but at times it remains merely decorative. Even decorative images, though, can convey information about the person represented, such as his age and status, or if he is a member of one's own group or is a foreigner. This information is coded in regular ways, both in the physical features depicted and with special symbols.

The distinctions that we make between appearance and content, between a decorative figure and one filled with symbolism or power, are recent in human history. Early art was magic. An image can be so powerful that one of God's commandments to Moses was "Thou shall not make graven images." In the Paleolithic carvings and cave paintings, wild game predominates, but we also see the hunter as well as the hunted. The pregnant horses on the cave wall and the sexually exaggerated "Venus" figures probably were made to increase the fertility of the world around the artist.

The human image often ties the living to their ancestors. Representations of the dead serve as memorials; homes, guardians, protectors, or placaters for the spirit of the deceased; channels through which the living can communicate with the spirit world and the dead; and actual physical embodiments of the ancestors. The images establish ties with the ancestors, and through these ties, the group's claim to authority, rights, or territory is created and validated and the proper order of the world is maintained.

The gods and spirits which a group sees in the world around itself are often given human qualities and represented in human form. The degree of anthropomorphization differs from group to group and deity to deity, but the projection of human aspirations and foibles onto the supernatural is common. As with the human group, the cultural and personal identity of each god is coded in symbols used in its image.

"Gods, Spirits, and People" does not include pieces that were primarily decorative, but focuses on human images that were used to symbolize or maintain a group's social cohesion. Some of the ways images do this are through ties to ancestors or deities in human form, through assertions of rank or authority, and through initiation/inculturation into the society.

The artifacts in this exhibit are clustered in seven main groupings: funeral and memorial figures, ancestor figures, spirit and deity representations, authority and rank figures, figures that emphasize the social group through characteristics of costume or body decoration, masks of humans, and figures that illustrate different ways of looking at the human image.

Within the layout of the exhibit, the last subgroup is separated from the rest. It covers the additional theme of "Looking at People," which asks the viewers to consider the artifacts from a visual perspective and invites them to look at the rest of the exhibit in ways they otherwise might not have. Five topics illustrate this theme: realism versus stylization, variations and similarities, body decoration, costumes and hats, and foreigners. FM

ANCESTRAL SKULL

This human skull served as a memorial to the deceased. It has a carved wooden face and is covered with a black gum (*tita* nut). The inlay of mother-of-pearl shells is set in designs which simulate face painting or scarification.
Solomon Islands.
Early 20th Century.
Fuller Collection.
Cat. 276594
Height: 7"

Photo by Diane Alexander White
109978

EMACIATED FIGURE
(detail)

Oral tradition states that this figure represents a starving man of an early Easter Island population that had fled into the interior of the island when the present people arrived.
Easter Island.
19th Century.
Fuller Collection.
Cat. 273234
Height: 17″

Photo by Ron Testa
109930

HEADDRESS MASK

Masks and figures were used in Vanuatu (formerly the New Hebrides) in ceremonies that marked a man's progression from one graded social level to the next. The pieces conformed to the designs established for each level, but varied in quality, as they were made by each man's sponsors, not by an "artist." The boars' tusks in it, which symbolize wealth and prestige, are from pigs that were sacrificed as part of the ceremony.
S. W. Bay, Malekula, Vanuatu.
Early 20th Century.
A. B. Lewis, collector,
Joseph N. Field Expedition.
Cat. 133080
Height: 14″

Photo by Diane Alexander White
109986

KACHINA DOLL

This doll represents the *Kawaika* kachina spirit. Kachina dolls were made for children and helped them learn about the different sacred kachina spirits. During the annual cycle of dances, masked dancers impersonated the kachinas.
Hopi Indians,
Shungopavy Pueblo, AZ. 1951.
Gift of Byron Harvey III.
Cat. 82863
Height: 12½"

Photo by Diane Alexander White
109975

LEDGER BOOK DRAWING

Native American artists made drawings on paper from ledgers or notebooks supplied them by whites. These drawings illustrated Indian life or events in the life of the artist. This Cheyenne drawing shows 10 warriors on horseback in full regalia.
Cheyenne Indian, Darlington, OK.
Late 19th Century.
H. R. Voth, collector. Cat. 48213
Height: 8"

Photo by Ron Testa
107546

EKPO SOCIETY MASK

The *Ekpo* society was a secret society to which Ibibio males belonged. It was concerned with maintenance of the social order and propitiation of the spirits of the ancestors. This mask, like many Ibibio *Ekpo* masks, has a movable lower jaw.
Ibibio tribe, Nigeria.
Late 19th Century.
Gift of Calvin S. Smith. Cat. 25038
Height: 20"

Photo by Ron Testa
and Diane Alexander White
109452

CEREMONIAL BOW STAND
near right
(detail)

Fine carvings could serve as symbols of rank. This bow stand was an emblem bestowed upon the guard of a chief's primary wife.
Baluba tribe, Zaire.
Early 20th Century.
Gift of Mrs. A. W. F. Fuller.
Cat. 221072
Height: 32½"

108712

ULI ANCESTRAL FIGURE
far right

Carved wooden *uli* were found only in a limited area of central New Ireland. They were set up in special houses during the ceremonies held in honor of deceased heads of totemic clans. After the ceremonies, the figures were carefully wrapped and kept in the men's house, to be used at some later date in a similar memorial ceremony.
The *uli* represents a male ancestor. The small figures represent his offspring. The breasts of the figures probably symbolize the female ancestors and importance of women in the tracing of descent through matrilineal clans.
New Ireland Province,
Papua New Guinea.
Early 20th Century.
A. B. Lewis, collector.
Joseph N. Field Expedition.
Cat. 138791
Height: 4'6"

Photo by Diane Alexander White
109959

WOODEN FIGURES OF TWO EUROPEANS

These figures represent a judge and a sea captain as seen by the Haida carver. While the figures are both very similar in dress, Judge Pemberton has a top hat and sea captain George Smith has a cap.
Haida Indians,
Queen Charlotte Island, B.C.,
Canada. ca. 1890.
J. Deans, collector. Cat.17990
Height of Judge: 11" 109609

Continued from p. 9

It was getting late when we reached the seacoast town of Trabzon, but we stopped only long enough to pick up some eggs and oranges. The weather had turned much warmer, and we were glad to be able to camp out again. We detoured to the shores of the Black Sea, removed our gory supercargo, and took the heads down to the water to skin them and remove the brains. Only when we had them thoroughly cleaned and repacked did we begin a search for a campsite. We found a place with a running stream nearby and set up our tents.

We woke to a perfectly beautiful day. Not too far from our campsite was a small village tucked into the side of the mountain; on the other side, the Black Sea was visible under the span of a little bridge. We were in a fertile, cultivated area, and the riches of water after arid Iran was refreshing. Even the architecture was different. Where Iran had walls around everything — even the most humble dwellings — in Turkey each house was a separate unit set quite apart from the others. The roofs of most houses were flat — some of tile, some of heavy shingles. A series of small square houses walking up the hillside gave the appearance of being in Europe rather than the Mideast.

The following morning we followed the highway along the shores of the Black Sea toward Samsun. The road was narrow, winding, and under repair. We weren't making good time at all, but the scenery was spectacular, so we really didn't object to the slow drive along the seashore. For lunch, we picnicked by the sea. No sooner had we set out our things than eight little boys and three men clustered around us, asking what we were doing and where we were going. It was just like Iran.

Later, Jan was riding in front with Nicola and trying to get some pictures of the countryside. We saw ahead a group of Turkish women digging in the soil on both sides of the road. We stopped the car, and Jan raised her camera to compose her picture and focus on the group of women to the right of the car. Just then we were spotted —and all hell broke loose! The women began shrieking at us, and this attracted the attention of the women on the other side of the road. In a body, they all began advancing threateningly toward the car holding their sturdy spades high, apparently bent on some kind of mayhem. Simultaneously, some boys who had been working with the women started throwing rocks and clods of dirt at our vehicle.

Morning, after sleeping in the open.

It was no time for a parley, so I told Nicola, "Shut the window and let's get out of here!"

No windows were broken and none of the women got close enough to us—or the car—to do any real damage. Only after we were out of range of their screams and missiles did we calm down a bit.

Available Now at the Field Museum Store

IRANIAN ADVENTURE
The First Street Expedition

by William S. and Janice K. Street
with Richard Sawyer

$14.95
10% discount for Field Museum members

softcover
320 pages, with color plates
and black-and-white illustrations

PUBLISHED BY FIELD MUSEUM OF NATURAL HISTORY

Jan Street with labeled bat specimens on drying board.

Bill Street in camp; Explorers' Club flag flutters from tent pole.

"Nicola," I asked, "what were they screaming at us?"

"They were calling us 'infidels,' " he replied somberly.

"Just because Jan wanted to take a picture of them?"

When I thought of the millions of dollars in Point Four aid that the United States had poured into Turkey for agricultural development, I begun to get downright mad.

"When I think of all our country has done for the Turks," I told Nicola, "I've got a good mind to go back there and tell those people a thing or two."

Nicola became deadly serious. "Don't do it, Mr. Street. They will kill you if you do."

Unbelieving, I looked at Nicola and saw that he meant every word he had said. And I realized that he was right—they probably would have tried to kill us. I simply had not taken account of the great differences in culture and values between us and the people by the road. To us a snapshot was a small thing; to them it was an unforgivable violation of privacy—perhaps even a breach of their religion's prohibition of graven images. If we had been able to meet on a personal basis, the situation might have been different. But the crowd reacted emotionally to our strangeness and foreignness and there was no opportunity to reach out across the barrier of our different beliefs.

We didn't reach Samsun until nine o'clock that night; there we stopped at Otel Vidinle and engaged two rooms. We had our supper at the hotel, complete with two aperitifs and two beers. When we checked out the following morning, our bill for lodgings and for meals for four people was $11.17! There are many places today where you could spend that for just one round of drinks.

When we stopped for fuel and asked about the road to Ankara, the attendant said, "Part of the road it is asphalt; part of the road is good." We again headed inland on a southwesterly tack and made good time through rolling hills. The land showed signs of a great deal of cultivation, and we saw many fine flocks of sheep and goats. Farming methods were primitive, and we noted that oxen and water buffalo were drawing the plows, harrows, and farm wagons.

Ankara (Angora) was a large and bustling city, and we had some difficulty in finding a place to stay. We finally landed at the Balin Oteli and were glad to have found shelter, because the weather had again turned overcast and drizzly. When we awakened in the morning, it was pouring rain, but we decided to see some of the ancient city anyway. We had been told that breakfast was served at 7:00 a.m., but there was no sign of it or of anyone who might have served it. We had a glass of

Tang, which we always carried with us, then went downstairs and rooted around in the refrigerators until we found something that suited our fancy! Jan and I both had bananas, and I also had a bowl of rice pudding. Very satisfying; not your usual breakfast fare, but, all in all, more than adequate for a self-service meal.

After a too brief stay in Ankara, we continued our journey. Driving in a slight overcast, we made our way to Istanbul and settled into the Otel Park. The hotel was a rather good one, and we felt the management must have taken one look at us and put us as far out of sight as possible. They relegated us to the catacombs. The hotel was built into the side of a hill, and our rooms were down three flights of stairs in one of the less desirable sections. After the hotel accommodations we had seen in the last seven months, being slighted at the Otel Park bothered us not one whit.

Although we were to have little time in Istanbul, there were a number of things we simply could not leave without seeing. In the afternoon we took a sightseeing bus for a tour of the city, visiting the Blue Mosque, the old palace (now a museum), St. Sophia Mosque, and the bazaar. Amid the incredible crush of people and the rumble of commerce, we could still catch glimpses of the ancient city that had gone by at least three names. From more than five centuries before the birth of Christ until approximately A.D. 330 it was known as Byzantium; from 330 to 1453 it was Contantinople; and since 1453 it has been Istanbul. We walked through miles of jewelry shops, rug shops, and the stores of brass merchants in the sprawling bazaar. It has been estimated that the bazaar alone holds some four thousand shops.

Selected specimens from the first two months in the field, on view at the Streets' hotel in Tehran.

About eleven o'clock the next morning, we set out for Alexandroupolis, Greece, by a new road touted as being shorter and faster than the old.

We thought little of it when a few flakes began to fall, but as we drove on, the snow became heavier and heavier. We began to encounter drifts across the road. Suddenly, we came on a stalled car blocking much of the road. The hapless driver was attempting to install his chains and having an awful time of it. Nicola tried to inch around cautiously on the right side of the other vehicle, but we hadn't gone five feet before we too were in a snowbank. Fortunately, a snowplow came along and pulled us out. When the driver tried to pull out the first car that was in trouble, the tire of the big machine simply spun. Finally, we attached our rig to the first car, and the snowplow put a line on us, and all of us managed to get onto a cleared part of the highway.

Three snowplows were working in the area, and the only safe course was to fall in behind one of the slow-moving giants and keep our wheels turning. Every once in a while one of the snowplows got stuck, and the other had to rescue it. With all the slipping and sliding and creeping along in low gears, it took us five hours to get through that area.

We started to stay in one of the small towns on the Turkish side of the border, but the hotels there looked grimmer than any we had seen in all our journeys. On inquiry, however, we learned that the roads were clear to the Greek border, so we decided to attempt it, late as it was. We picked up a hitchhiker who was going to Kesan, dropped him off there, and paused long enough to have supper. The weather had become sharper, colder, and

we again hesitated about pressing on. In the restaurant we asked if the border was open. A young man heard our question; he told us that he worked at the border and assured us that the customs station was open all night long. He even volunteered to take us there and help us through. We felt that Lady Luck was again smiling on us.

When we reached the last town on the Turkish side of the line, our young man took us to the local gendarmerie where we were again told that the border was open all night. The young man who had accompanied us, however, left us at this point. It seemed that he didn't work at the border at all—he just told us that so we would give him a ride.

Armed with the best information obtainable, we decided to proceed to the border. It was only a few miles further on, but the wind was blowing a gale, and we hoped to clear the boundary quickly and get into Alexandroupolis and a hotel. When we arrived at the border crossing we discovered, to our dismay, that all the border guards had gone to bed. The gates would not officially open again until morning. But our luck had not run out. The border guards roused themselves and were very accommodating; they invited us into the guard house while they dressed and, after courteously looking over our passports, they opened the gates and allowed us to cross the bridge into Greece.

In the middle of the bridge were two sentry boxes—one manned by a Turk, the other by a Greek. Past those, on the Greek side, we pulled three more sleepy guards out of bed. They didn't stand on formality, not even bothering to put their robes on over their pajamas. It was the only time in many years of world travel that I remember conducting official business with a man dressed in pajamas and slippers. But the Greeks, too, were pleasant to us and told us that regardless of the hour, we were sure to find a hotel room in Alexandroupolis.

They were right. At one o'clock in the morning we took rooms at the old-but-clean Metropole Hotel in Alexandroupolis and tumbled into bed for a wonderful night's sleep. We had left Asia and were once again back in Europe. Our journey was truly nearing its end. The following day we would arrive in Thessaloniki, then take the boat from Greece to Italy, and then make our way on to Paris.

Beyond Paris, we looked forward to the cooling fogs and soft rain of the Pacific Northwest of the United States. We were ready to go home. And we would return to Seattle comfortable in the knowledge that we had done something worthwhile.

Col. Galesorke, Iranian manager of fish and wildlife (second from right), joins Doug Lay, Jan and Bill Street (from left) during specimen viewing at Tehran hotel.

Our expedition to Iran had brought immediate as well as long-lasting rewards to Jan and me. We were at a time in our life when many of our contemporaries were beginning to redefine their goals, beginning to be less adventuresome rather than more so. If there is a lesson here, it is that one can resist the encroachments of age, can expand personal horizons, and can not only seek adventure but bring it off decisively.

In Iran, with good help, we had learned to live on the land and on the terms the land laid down. The land was uncompromising, and surviving and working on its terms required resiliency and flexibility of a couple of candidates for the rocking chair. Nevertheless, we did a job of work and quite boldly, I thought, took the opportunity to explore and work in a land now so transformed politically that what we did may never again be possible. We got in just under the wire.

As we look back on our experience we found no way to compare it with our earlier African safaris or many hunting trips. Those had been personal quests, and the decision to take or not to take a trophy was ours alone to make. Now we were charged with finding each specimen as a museum trophy. Not one was kept by us.

Our reward has been the relationship with our associates and overseas friends as well as the continuing flow of new knowledge brought forth by the publications arising from the studies.

We treasure our experience. We liked it very much. FM

Afterword A
The Streets and Their Expeditions

by Alan Solem
Curator and Head, Division of Invertebrates

As a very new assistant curator at Field Museum of Natural History in the 1950s, I first heard of Bill and Jan Street when they contemplated an expedition to Iran and wanted to know whether somebody from Field Museum who could skin and prepare mammals might be available to participate. Although very eager to travel, I was a land snail specialist and completely lacked the necessary qualifications.

When their field program expanded in the mid-1960s, more and more of Field Museum staff were consulted by them before their trips. I thus made a special plea that they try to collect land snails in Afghanistan during their 1965 expedition. They found thirty-seven species, four new to science, including *Subzebrinus streeti* Solem (1979, Fieldiana: Zoology, New Series, 1:33-36), and another ten new to Afghanistan, thus making a significant addition to our knowledge of the Afghan snail fauna.

By the early 1970s, we were well acquainted. When they indicated a desire to sponsor another expedition, and I was energetically trying to develop a multidisciplinary field program in Western Australia, it was easy to combine planning efforts with the added cooperation of the Western Australian Museum, Perth. Sparked by the initial offer of mammal survey support by the Streets, the largest inland scientific expedition in Australian history converged on the Mitchell Plateau in the northwest during October 1976.

Bill and Jan Street, I, and assistants shared the red dust, fought the packs of flies, changed one another's flat tires, made similar and different wrong turns off tracks, contrasted and learned from the divergent Australian and American camping styles, and felt the same sense of fulfillment and joy during even the hottest of Kimberley days.

On reading their Iran account, I became impatient with the piles of papers, ringing telephone, and scheduled meetings in Chicago. I was — no, am — ready to depart for another place from which we have too little material for effective study. Be it North America, Africa, Asia, or Pacific Islands, no place in the world has had its living secrets adequately revealed.

Who are these special people?

William Sherman Street was born September 30, 1904, in Oakland, California. After receiving his college education at the University of California, Berkeley, he began a merchandising career at Hale Brothers' Store in Oakland. He eventually became president of Frederick & Nelson department stores, Seattle; served as executive vice president of its parent store Marshall Field & Company of Chicago; was general manager of the Chicago stores for three years; and served as director of the parent company. During these career years, Bill also took on numerous civic, community, and national responsibilities. He is also a member of the Commercial Club of Chicago.

He served eight years as a director of the U.S. Chamber of Commerce during the Eisenhower administration — six of these years as chairman of the Committee for Economic Policy and one as chairman of the Canadian-American Committee. From 1957 until its opening in 1962, Bill Street was deeply involved in the organization of the very successful Seattle World's Fair—the Century 21 Exposition. In 1961-1962 he was chairman of the operating organization, Century 21 Exposition, Inc.

After taking early retirement from Frederick & Nelson and mounting the first Iran expedition, Bill Street assumed the presidency of United Pacific Corporation, an investment banking firm now known as Univar Corporation; he was later chairman of the board until his next retirement in 1974. He also held directorships in several corporate and civic organizations.

Jan Kergan was born in Oakland in 1902. She

graduated from the University of California in 1924 and married Bill Street the next year. Her busy life has woven together a great many interests. She has worked extensively with the Red Cross and in the fields of community and children's health. She has been active in Children's Orthopedic Hospital, the Arboretum Foundation, and the National Society of Colonial Dames; she has been president of the Seattle Children's Home and a fellow of the Explorers' Club. After her experience as co-leader of Field Museum expeditions, she lectured extensively before schools and clubs in Oregon and Washington. She is an involved and resourceful person.

Bill and Jan have seen their three children go on to successful careers. Georgann Street Evans is a painter and sculptor who has been on the faculty of the University of California; William K. Street is president of Ostrom Company of Lacey, Washington; and John S. Street is former president of Germaine Monteil, New York City.

Today, nearly twenty-four years after the realization of the 1962-1963 Iran Expedition, Bill and Jan Street continue to enjoy their home near Oso, Washington, keep up with the many friends made on their journeys, watch with quiet pride the stream of published results from their expeditions, follow the careers of the many students who worked with them, and observe the progress of their twelve grandchildren and seven great-grandsons.

Afterword C
Fruits of Their Labors

by Robert M. Timm
Curator-in-Charge of Mammals
Museum of Natural History, University of Kansas
(recently Head of Field Museum's Division of Mammals)

William and Janice Street organized and led five different foreign expeditions for Field Museum: two to Iran (1962-1963 and 1968), one to Afghanistan (1965), one to Peru (1975-76), and one to western Australia (1976-77). This book reviews just the first of these—each was a unique adventure of its own. The logistics of organizing an international scientific expedition are truly phenomenal. It takes special people with the right combination of patience, drive, political savvy, sensitivity, and intestinal fortitude to pull it off. For those special few who have led a successful expedition, there is probably no greater thrill. It remains a highlight of their lives. The inner satisfaction of successfully tackling formidable odds, accomplishing goals, and producing a valuable collection to be studied by generations of scientists is an indescribable feeling. Often the people who work together on such an expedition develop lifelong friendships far stronger than bonds developed under more normal circumstances.

Over two decades have passed since the Streets' first Iranian Expedition. It is appropriate to ask what was gained, what was learned, what was the long-term legacy of their effort. What happened to the specimens, the people? What were the products?

The most tangible products of an expedition are the specimens brought back for study. The Street expedition to Iran collected nearly thirty-five hundred specimens of mammals; several hundred specimens of birds, reptiles, amphibians, and fishes; and thousands of specimens of parasitic arthropods—the fleas, lice, ticks, and mites. To put this world in perspective, Field Museum's collections now house one of the finest collections of these groups in existence anywhere.

Preparation of specimens in the field requires a tremendous amount of work; however, it is just the beginning. Upon completion of the field work, all specimens must be carefully labeled, fumigated to prevent damage by insect pests, and packed for shipment home. Scientific specimens must be packed well enough to withstand the worst possible treatment at the hands of the shippers, and often that seems to be just what they receive! Once everything has arrived safely at the Museum, the pleasurable but extremely laborious process of sorting, labeling, and final preparation begins. Specimens that have been improperly labeled or prepared are worthless; thus these final steps are as critical as those that originally obtained the material. For the mammal specimens, skeletons of the smaller species such as shrews and bats

are cleaned with the aid of dermestid beetles. Larger skeletons such as the wild sheep are cleaned in huge steam kettles. The result of both processes is beautiful white clean bone that will be resistant to decomposition when stored properly and will present scientists with material that is easy to study with accuracy. For the Iranian collections ten years were required for all specimens to be completely processed and finally incorporated into the research collections. They are now curated and actively being studied by a wide array of investigators.

The Street expeditions were especially valuable in that bright, young, enthusiastic, budding scientists were full participants. They were carefully chosen, then given full support both in direction by Museum staff and freedom to devote their energies totally to the project for several months. The Street expeditions were distinguished by the financial support provided to the young investigators afterward to prepare and study the collections in Chicago. This contributed significantly to the overall success of the enterprises. Training of future scientists, both in the United States and in the host countries, is one of the major roles of expeditions.

Doug Lay, the young mammalogist, went on to complete his Ph.D. studies, relying heavily on materials collected in Iran. He is now an active professional mammalogist, well respected as the world's foremost authority on the Mideastern gerbillinae rodents that he first met in Iran.

In addition, another Ph.D. dissertation study was based entirely on the Iranian collections. Anthony F. DeBlase's dissertation, a 424-page monograph entitled "The bats of Iran: Systematics, distribution, and ecology," was published in Field Museum's scientific series, *Fieldiana: Zoology*. It is considered the most authoritative work of its kind for all of Asia.

Fortuitously, Charles Reed, the Yale archaeologist, moved to Chicago and has utilized the Iran collections extensively in his studies to unravel the unknowns in how, when, and where man first domesticated animals such as goats, sheep, pigs, and dogs. With the aid of this material, techniques have been developed to distinguish bone fragments from archaeological sites that represent man's earliest domesticated animals. Additionally, age, sex, weight, and season of death can often be obtained now from mere fragments of bone, thus providing insight into the lives of ancient peoples and how they utilized and modified their world—insights into how civilization developed.

Carolyn Renzulli, a doctoral candidate at the University of Chicago, currently is studying the wild sheep collected by the Streets. Her dissertation will be a study of the functional craniology of these sheep, and a test of a biomechanical model that she has developed for skull function in horned bovids. Her studies are possible only because of the depth and strength of Field Museum's collections. The current and future value of the specimens is greatly enhanced because of the care taken in the field to obtain the maximum data for each and to preserve each specimen properly.

We are frequently asked, "Do scientists really study all these things?" The answer is a resounding "Yes."

In addition to staff scientists at Field Museum, visiting mammalogists, anatomists, archaeologists, paleontologists, anthropologists, veterinarians, forensic scientists, and an array of government agencies interested in conservation, customs, and enforcement of wildlife laws utilize Field Museum's collection of over 127,000 mammals. During a recent twelve-month period, scientists from twenty-eight states and eleven foreign countries spent some eight hundred visitor-days examining our mammal collections. In addition, we send out nearly a hundred loans of specimens each year to other institutions throughout the world. The loan and visitor use of Field Museum's scientific collections is one of the most extensive in the scientific world. And all of this goes on behind-the-scenes, outside of public view on the Museum's fourth and fifth floors.

The value of such an expedition is only partially realized when the specimens are safely tucked away in the Museum's collections. Their true value to science can only be measured over time, after the scientists study them. In recent years, an annual average of more than fifty technical papers and scholarly books have involved research in the mammal collections.

Tragically, Iran has been torn by war in recent years. The few reports we have concerning the current state of science and scientific collections in the country are disheartening. Apparently all scientific study collections, once a rich reflection of the region's history, are now destroyed and scattered. Additionally, many of the areas studied by the Street expedition have been ravaged by recent fighting. We must assume that the fighting and political turmoil in Iran has taken as significant a toll on wildlife and habitats necessary for wildlife as it has on human lives. Thus, the collections made by the Streets are truly irreplaceable.

Habitat destruction and the associated loss of wildlife is not a problem unique to Iran but is a global problem. It has been estimated that 60 percent of all species on the earth today will be extinct before scientist have a chance to study them. Time is running out. Will there be future people as farsighted as William and Janice Street assisting tomorrow's scientists?

FIELD MUSEUM TOURS

Sailing to the Land of the Maya Aboard the Tall Ship *"Sea Cloud"* February 14-24

Itinerary

Day 1
Miami/Georgetown, Grand Cayman

Depart Miami on a regularly scheduled flight to Georgetown, the principal town of Grand Cayman, largest of the three Cayman Islands. Columbus named the island Las Tortugas ("The Turtles") in 1503, for the giant sea turtles that inhabit the region. The flat, sandy island is peopled by descendants of Cromwell's soldiers, buccaneers, and shipwrecked sailors.

Upon arrival, transfer to the *Sea Cloud* and sail late afternoon.

Day 2
At Sea

Sailing due southwest in the Western Caribbean.

Day 3
Swan Island

Morning arrival at tiny Swan Island, a yachtsman's paradise. The coral limestone island is only 1½ miles long and 60 feet high. Formerly the site of a plantation, today only about 20 people inhabit the island.

Day 4
Roatan, Bay Islands

Morning at sea with afternoon arrival at Roatan, the largest of the Bay Islands in the Gulf of Honduras. Roatan was first settled by buccaneers who found the reef-locked harbors and lagoons perfect hideouts for raiding treasure ships.

Swim or snorkel in the blue-green reefs and explore the beautiful island on your own, enjoying the densely wooded hills, mountainous terrain, and quiet unspoiled atmosphere.

Day 5
Cochino Grande

Morning arrival at Cayos Cochinos, of Hog Cays. This delightful archipelago between Roatan and the Honduran mainland is an exotic tropical paradise reminiscent of the South Pacific. Time at leisure for swimming off the magnificent tranquil beaches and for snorkeling. Enjoy the afternoon at sea.

Day 6
Puerto Barrios/Tikal/Puerto Barrios

Early morning arrival in the Guatemalan port of Puerto Barrios for an optional full-day excursion by air to Tikal,

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

one of the oldest and most beautiful of all Mayan sites. Located deep in the Peten Jungle, Tikal was occupied from at least 600 B.C. through the ninth century A.D. It is thought to have been the most important Mayan center of the Classic period.

A tour of the site includes the Great Plaza and several of the flat-topped pyramids towering above the rain forest. The structures support beautifully decorated temples where the priest-astronomers charted the motion of the stars.

Day 7
Half Moon Cay, Lighthouse Reef, Barrier Reef of Belize

Morning arrival in Belize's barrier reef, the world's second largest, stretching for more than 120 miles. Undiscovered by the cruise liners and mass tourism, the area is a paradise for sailors, snorkelers, and nature lovers. The reef community constitutes the earth's oldest and most complex ecosystem, dating back two billion years. The inner mangrove cays are covered with impenetrable growth, and on the outer sandy cays tall palm trees fringe sandy beaches.

Spend the day at Lighthouse Reef exploring the Blue Hole, a remarkable phenomenon that is part of an underwater national park. More than 15 miles long, the hole is surrounded by coral that rises to the surface of the lagoon.

Also visit several atolls of Lighthouse Reef, including Half Moon Cay, which has a large colony of red-footed boobies.

Day 8
At Sea

Enjoy a magnificent full day at sea on board the *Sea Cloud*.

Day 9
Playa Del Carmen/Tulum/Coba/Chichen Itza

Disembark in the morning at Playa Del Carmen, a small port on the Yucatan. Continue to Tulum, the City of Dawn. This isolated city overlooking the Caribbean is the only known Mayan shore-side settlement. Of the 50-plus structures within the walls, the Watchtower, Temple of the Frescoes, and Temple of the Descending God are the most fascinating.

After lunch depart for the majestic site of Coba, meaning "wind ruffled water." Situated amid five lakes, Coba was one of the largest Late Classic centers and resembles the site of Tikal in Guatemala in its numerous baffling causeways. Visit the pyramids of El Castillo and Nohoch Mal. Continue to Chichen Itza with accommodations at the *Hotel Mayaland*.

Morning and afternoon tours explore Chichen Itza, the magnificent metropolis and principal religious center of ancient Yucatan. Evidence of Toltec influence is obvious throughout the complex in motifs of feathered serpents, warriors, eagles, and jaguars. Visit the Great Pyramid, built to represent the Mayan calendar; the Temple of the Warriors, scene of sacrificial rites; the ceremonial ball court; and the astronomical observatory. Lunch is included. In the evening attend a farewell cocktail reception.

Day 10
Chichen Itza/Cancun or Merida/Miami

Transfer to the airport for the regularly scheduled return flight to Miami via Cancun or Merida.

Ron Testa

Guest Lecturer: John W. Fitzpatrick is curator of Birds and chairman of the Department of Zoology at the Field Museum. He received his Ph.D. in biology from Princeton in 1978. Fluent in Spanish, Dr. Fitzpatrick has extensive experience in Central and South America and in the Caribbean. He has lectured on numerous Field Museum tours, including a previous tour of the Lesser Antilles aboard the *Sea Cloud*. He is the author of more than 50 articles on birds and recently co-authored a prize-winning book on Florida scrub jays, published by Princeton University Press.

RATES

Stateroom Category — Description	One Person	Each of 2 Persons
Type C—Outside stateroom with one lower bed and an upper berth, shower. Staterooms 15, 17, 18, 20		$3,595
Type B—Outside stateroom with two lower beds, shower. Staterooms 21, 23, 24, 25, 26, 27, 28, 30		$3,995
Single Type B—Outside stateroom with lower bed, shower. Stateroom 29, 32	$5,495	
Type A—Outside stateroom with two lower beds, shower. Staterooms 19, 22, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41		$4,395
Superior—Original outside stateroom with double bed, shower. Staterooms 5 (bathtub), 6, 10, 14		$5,095
Single Superior—Original outside stateroom with lower bed, shower, Stateroom 11	$6,595	
Deluxe—Original outside stateroom with double bed or two lower beds, private bathtub, shower. Staterooms 3, 4, 7		$5,495
Single Deluxe—Original outside stateroom with lower bed, shower. Stateroom 8	$6,995	
Suite—Original owners' suite. Outside with double bed, private bathtub, shower. Suites 1, 2		$6,895

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FIELD MUSEUM OF NATURAL HISTORY BULLETIN

February 1987

"Families: A Celebration of Love, Diversity and Commitment"

Photographic Exhibit Now on View in Gallery 9

Field Museum of Natural History Bulletin

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COVER

"Families: A Celebration of Love, Diversity, and Commitment" is a new photographic exhibit on view in Gallery 9 through April 15. Featuring 13 family groupings, the exhibit affirms and celebrates the diversity of family life in America today. Each photo grouping is illuminated by comments from a child member of the family, with attention to differences and similarities between families. A child from a racially mixed family, a child who just lost a parent, an adopted child with a single parent—all have much to share about the concept of a family. "Families" explores issues of support, responsibility, affection, and love, as well as some of the struggles shared by all family groupings.

The exhibit space for "Families" includes an activity center where parents and children can sit and talk about the exhibit. Children (and adults) can add their comments and family "portraits" to the exhibit, using the writing materials provided.

"Families" is an example of Field Museum's commitment to create more interaction between visitor and exhibit subject matter. It is one of the many exciting new exhibits and programs comprising Field Museum's "new look" in 1987.

"Families" was conceived and designed by the Boston Children's Museum. Photo by Aylette Jenness, Courtesy Boston Children's Museum.

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Events

African Heritage Celebration

Weekends in February

THE EXTRAORDINARY RICHNESS and vitality of African culture is explored in a series of weekend performances and demonstrations at Field Museum. Discover the often "secret" craft of creating vivid batik or tie-dye patterns on fabric. Watch as Chicago artist Derrick Webster creates fantastic and colorful caricatures of people from "found" scraps of wood. Listen to Harvey Duckworth relate the history of "Bow Tie" and "Trip around the World"—two of the traditional quilt patterns he uses.

Storytelling figures prominently in African culture. Trace the history of "story cloths" traditionally made by the men of Dahomey. Against a backdrop of American rhythm instruments, listen to tales from Africa and the Caribbean, or add your signature to one of Marva Jolly's ceramic story pots.

All family activities are free with Museum admission.

Saturday and Sunday, February 7 and 8

Noon to 2:00pm: African Batik and Tie-dye, with Jahmila Kago Norkware.

Folk Art, with Derrick Webster.

2:00pm: Mandingo Griot Society, with Foday Musa Suso. Traditional African instruments combine with electric bass and percussion to produce this unique form of "fusion" music. Foday Musa Suso, a praise singer and oral historian, is a Griot from Gambia who traces his ancestry back 4,000 years.

Saturday and Sunday, February 14 and 15

Noon to 2:00pm: Dahomy Appliqué, with Lucille Graham.

2:00pm: Rhythms and Songs of Childhood, with Ella Jenkins.
The legendary Ella Jenkins encourages you to snap fingers, clap hands, stomp feet, hum, and whistle in this spontaneous and impromptu sing-along concert.

Saturday and Sunday, February 21 and 22

Noon to 2:00pm: Stories and Songs of African People, with Shanta Nurullah.

Storytelling Pots, with Marva Jolly.

Quilt and See, with Harvey Duckworth.

2:00pm: *Sounds In the Forest and the New Yam Festival,* with Darlene Blackburn Dance Troupe.

Sounds In the Forest uses story, song, and dance in telling this special children's tale of Lion, Monkey, Rabbit and Bird. *The New Yam Festival* presents an exciting celebration just before a new harvest.

CONTINUED →

Events

February Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the *Weekend Programs* sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

February

1 1:00pm *Welcome to the Field* (tour). Enjoy a sampling of our most significant exhibits as you explore the scope of Field Museum.

7 11:30am *Ancient Egypt* (tour). Explore the traditions of ancient Egypt from everyday life to myths and mummies.

22 1:00pm *Welcome to the Field* (tour). Enjoy a sampling of our most significant exhibits as you explore the scope of Field Museum.

World Music Program

Weekends in February
1:00pm and 3:00pm

ENCOUNTER MUSIC from around the world as you travel through the great halls of Field Museum. Experience the sounds and textures of India, China, and Egypt through live musical demonstrations and informal discussions. For further information, ☎ (312) 322-8854.

Chinese four-stringed guitar. Four strings represent the four seasons. Cat. 127541.

Events

"Gentle, Communicative Killer Whales"

John Ford, Research Zoologist,
West Coast Whale Research Foundation,
Vancouver, B.C.
Saturday, February 21, 2:00pm

Sleek, powerful, and fearless, they rule the seas. With swift thrusts of their tails, they leap from the water or chase down their prey. Once creatures of mystery seen as blood thirsty man-eaters, killer whales have been found to be highly social, intelligent, even gentle animals.

The *Orinus orca* (commonly call the killer whale) has shed its aura of mystery and menace. Extensive research has revealed not a single documented case of orca attacking or killing human beings. During the mid-1960s popular press did much to endear the orca to the general public and fade their dreaded image.

Zoologist John Ford and his research colleagues have studied the behavior, population dynamics, and communication sounds of the whales found off the coast of British Columbia. These 14 years of extensive research have contributed greatly to increased knowledge of orcas. They have found that these whales form "families," or pods, that are remarkably stable units. It appears that the only way a pod member arrives or leaves is by birth or death. Pod communities are divided into residents—orcas who do not actually migrate—and transients who travel a much broader range and behave quite differently.

One of the most striking differences between individual whale pods is the variation in their communication sounds. Dr. Ford has studied communication sounds among orcas for the last eight years. Through the use of hydrophone recordings, he is able to demonstrate that each whale pod has its own distinctive dialect. Dr. Ford discusses his most recent research, documents his extensive observation with slides and tape, and shares with us some of his incredible experiences with the orca whales.

Tickets: $6.00 ($4.00 members). This program is funded in part by the Ray A. Kroc Environmental Fund.

Registration

Be sure to complete all requested information on the ticket application. If your request is received less than one week before a program, tickets will be held in your name at the West Entrance box office. Please make checks payable to Field Museum. Tickets will be mailed upon receipt of check. Refunds will be made only if the program is sold out.

☐ Member ☐ Nonmember

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Return complete ticket application with a self-addressed stamped envelope to:

Field Museum of Natural History
Public Programs: Department of Education
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Have you enclosed your self-addressed stamped envelope?

Name

Address

City State Zip

Telephone: Daytime Evening

"Gentle, Communicative Killer Whales"
Members: $4.00 ea., nonmembers: $6.00 ea.

Member Tickets #Requested	Nonmember Tickets #Requested	Total Tickets Requested	Amount

Bushman

A Sprucing Up

Cosmetics for the male are heartily endorsed by Bushman, who patiently submits to the meticulous handiwork of taxidermist Paul Brunsvold. Photo by Ron Testa 84622

In life, Bushman was once voted as "the most outstanding and most valuable single animal of its kind in any zoo in the world." Indeed, the tall, powerful gorilla (6′2″ tall, 565 lbs. in his prime) had a charisma all his own. Among the memorable events in the lives of many Chicago-area children was first seeing this awesome creature in Lincoln Park Zoo, where he lived from 1930 until New Year's Day, 1951, when death came to him at age 23.

The Field Museum then acquired the body of the world-renowned ape, and for 35 years he has continued as one of the Museum's star attractions.

But 35 years of posing in a glass case can take its toll —skin dries out, hair and eyes lose their lustre. So recently, taxidermist Paul Brunsvold gave Bushman a sprucing up. Brunsvold's treatment consisted of applying a lanolin solution to soften and condition the skin, repainting certain skin areas, reglazing the eyes, and brushing and combing his fur.

And to better show off his handsome new look, Bushman has ambled down to the ground floor, not far from the Children's Store, ready to greet more generations of admiring visitors.

The following anecdote concerning Bushman's infancy in Africa and how he was adopted by missionaries was written by Marion Faulkner Miller, whose late sister, Annie Mary Allen, told her the story some years ago. Mrs. Allen was one of those who found and took care of the infant gorilla when found in 1928. Mrs. Miller is now a resident of the Presbyterian Home in Evanston, Illinois.

Bushman and the Presbyterian Missionaries

by Marion Faulkner Miller

A baby gorilla toddled into the Presbyterian Missionary compound in Cameroon, West Africa one afternoon early in 1928. This little fellow proved to be the way to a beautiful stained glass church window for the missionaries, James and Annie Mary Allen, stationed there from the Fourth Presbyterian Church in Chicago.

The missionaries and native Africans took turns cuddling and comforting this small gorilla while several of the Africans set out into the jungle in search of its mother. When darkness approached, they returned, having found no trace of the adult gorilla. It was obvious that the little fellow was hungry. Since he could not yet eat solid food, what could he be fed? The missionary, Dr. Johnson, prepared a baby formula as he would for a human baby, and the gorilla devoured it with gusto. Thereafter, Annie Mary Allen, the wife of James Allen, continued to prepare the same formula for the infant gorilla.

Continued on p. 25

OWLS OF CHICAGO

A Field Museum Feature
On Local Natural History

by JERRY SULLIVAN

When I was a volunteer at Lincoln Park Zoo, I used to take owls to fifth grade classrooms around the city. We were docents working in two-person teams, and we arrived at each school with two cages and a bag. The cages held a bird and a mammal. There was a snake in the bag, usually a boa constrictor.

Boas were ideal for our purposes. They are big and powerful looking. They are beautifully patterned. They are creepy as the devil, flicking their forked tongues at the kids. And they are docile enough to let the children lightly stroke their smooth dry skin.

We used to do a 45-minute presentation, 15 minutes per animal, and experience quickly taught us to save the snake for last. Nobody could follow his act. Nobody, that is, except an owl. Bring out any other bird—and we used parrots, sparrow hawks, crows, and even a toucan—and we'd lose a third of the class. Bring out an owl and you can reduce the most blase fifth grader to open-mouthed wonder.

We used three different owls at various times, a red phase screech owl, a great horned owl, and a barn owl, but the reaction was the same no matter what owl we showed them.

Our fifth graders were not the first humans to react that way to members of the order Strigiformes. Owls have been making strong impressions on people for as long as people have been recording their impressions. The ancient Egyptians identified one of the human souls—they believed we have three—with the barn owl. This particular soul stayed near the tomb after death, and we can guess that barn owls did the same thing. The birds got their common name from their habit of nesting in buildings. Apparently they got the habit almost as soon as there were any buildings to nest in.

In the Old Testament, owls were part of a standardized curse the prophets would pronounce on rich and powerful cities that had departed from the paths of righteousness. Said Isaiah, speaking of the city of Edom, "And thorns shall come up in her palaces, nettles and

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Chicago writer Jerry Sullivan writes frequently on birds for the Bulletin. *He does a column, "Field and Street," for the* Chicago Reader *and has done features on birds for* Audubon *magazine and other national publications. He was also editor of* Chicago Area Birds, *published in 1985 by Chicago Review Press.*

brambles in the fortresses thereof, and it shall be an habitation of dragons and a court for owls."

Owls became wise birds in Greece. Athena, goddess of wisdom, was usually pictured with a small, earless owl — perhaps a European little owl — sitting on her shoulder. Athens, her city, stamped a picture of an owl onto its coins.

Of course, owls have a dark side, a slightly creepy edge that simultaneously attracts and repells us, just as the boa constrictor does. They are birds of the darkness, haunters of graveyards, screamers in the night. Their calls are an augury of death. An owl is the familiar of one of Macbeth's witches, and it is the "obscure bird" that cries out when Macbeth kills the king.

I think their faces have a lot to do with the intensity of our reactions to owls. Hawks and eagles, the hunters of daylight, have birds' faces. Their foreheads slope sharply back from the tops of their beaks. Their eyes are set on the sides of their heads, and their throats recede directly from their lower mandibles.

But put a pair of glasses or a hat on an owl, and you have a human being with a big round face, a forehead at the top, a chin at the bottom, two big eyes that look directly at you, and, set below them, a hooked beak that could stand for a nose.

That distinctive, almost human, face has been shaped by natural selection, and many of the secrets of owls' success as nocturnal hunters are hidden in it. Start with the facial disk, a thin line of specialized feathers that outlines the cheeks of that humanoid face. Facial disk feathers grow very close together. They are roughly paddle-shaped, narrow at the base and wide at the top. The central quill of each feather is thickened and the webbing is quite dense.

This dense wall of feathers serves as a barrier to sound waves. Sounds hitting the disk bounce off and are funneled inward toward the bird's ear. What we have here, in other words, is a parabolic reflector just exactly like the ones we use to pick up faint and distant sounds. The only difference is that our reflectors concentrate the sound toward a microphone rather than an ear.

And then there are the ears themselves. We can't see them. They are completely hidden under the owl's soft body plumage (the so-called ears of long-eared owls are actually feather tufts). The external openings of the ears are quite large, and, most remarkably, they are, in various ways, asymmetrical. Barn owls have flaps of skin along the edges of their ear openings, and the flaps are at slightly different positions on each side of the skull. Long-eared and short-eared owls go even further. The external openings of their ears are of different shapes and they are differently positioned on the sides of the skull. The internal structures are also quite different.

All this variation provides the owl with an excellent means of determining where a sound is coming from. Any animal with two ears can do a certain amount of direction finding. We can detect tiny differences in the time of arrival of sound waves at our ears. If they get to the left ear first, the sound is to the left; if they get to the right ear first, it is to the right.

But as anyone who has ever tried to find a singing bird in a tree can tell you, this system is considerably less than foolproof.

An owl's system is much more sophisticated. The variations in ear structure cause different frequencies to be heard at different levels of intensity in one ear than in the other. Experiments involving the planting of microphones in the ears of dead barn owls suggest that these differences vanish when the bird is looking directly at the source of the sound.

The effectiveness of this method of locating prey was demonstrated several years ago at Cornell University when barn owls proved they could hunt very well by ear. The birds were confined one at a time in a room as close to absolute darkness as the researchers could manage. As a test for darkness, they exposed high speed film in the room for one hour. It did not fog (fogging would have indicated the presence of light).

Chicago-Area Wildlife Series

This article is part of a continuing series on the wildlife of Chicago and the surrounding region. Previous articles have included "Chicago's Parakeets," "Lake Renwick: Unlikely Haven for the Endangered," "The Wooded Island: Chicago's Premier Birding Area," "Spring Wildflowers of the Chicago Area," and "Late Summer and Fall Flowers of the Chicago Region." Articles scheduled to appear in the coming months cover the subjects of local water snakes, spring bird migration, raising moths and butterflies, and a feature on one of our local native prairies.

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The northern saw-whet owl, Aegolius acadicus, *is the only tiny, tuftless owl apt to be seen in the Chicago area. It nests most often in a hole in a tree or stump and sometimes in an abandoned woodpecker's nest. Its usual call is a long series of short whistles.*

With the bird in place on a perch at one end of the room, the researchers scattered dead leaves on the floor at the other end and released a mouse into the room. The rustling of the mouse immediately attracted the owl's attention, and when the bird left its perch to strike at the mouse, it was successful 17 out of 21 times.

And then there are those eyes. They are quite large. A snowy owl, which weighs three or four pounds, has eyes as big as a grown man's, and those eyes are put together in ways that make them especially efficient when there is very little light. Like humans, owls have two types of visual receptor cells in their eyes. Rods, which are sensitive to changes in the intensity of light, and cones, which are sensitive to different frequencies of

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The Eastern screech-owl, Otus asio, *red and gray phase. Frequents wooded areas, where mice and small birds such as the house sparrow are favored food items. Its call is a soft, trilling note and sometimes a harsh cat-like screech. The two color phases seem to have no relation to age or sex, both red and gray birds sometimes being found in the same nest.*

light, which is to say, colors.

Diurnal creatures like us get our ability to see colors and our visual acuity from cones. Owls, which have enormous numbers of rods densely packed together, derive their ability to see in low light from these. They do, however, have enough cones to be able to see well in daylight.

The forward look of those eyes matters too. Owls have binocular vision over about 70 percent of their visual field, so they can make very accurate judgements about how far they are from anything they see. They supplement their binocular vision by bobbing their heads up and down or from side to side to get a good angle on what they are looking at.

Those eyes cause some problems too. They are so large that there doesn't seem to be any room for muscles to move them, so they are fixed in their sockets. An owl has a visual field of about 110 degrees, and to see to the right or left, it must turn its head.

Our demonstration of silent flight was one of the highlights of our owl show for the fifth graders. The barn owl was the best for this. Our great horned owl had been donated to the zoo after some idiot with a shotgun nearly destroyed one wing, so it could not fly at all, silently or otherwise.

The barn owl sat on my hand. I would wear a heavy falconer's glove, and the bird was secured by jesses, or straps. I would raise my arm high over my head, ask all the kids to be silent, and then drop my hand almost to the floor. The bird, to keep its balance would flap its wings, and the fifth graders would hear only the merest whisper.

Two characteristics of owl feathers are involved in dampening the sound of flapping wings. The barbules, the slender filaments attached to the central quills of the flight feathers, are tipped with hairlike projections that give the feathers a cushiony pile like velvet that effectively dampens the sound of feathers striking each other. One or more of the primary flight feathers at the tip of the wing have edges like the teeth of a comb, a feature that deadens the sound of air passing over the feather.

We used to ask the fifth graders what help silent flight would be to an animal that hunts in the dark and they would usually figure out that a stealthy approach would capture more prey, to which we might add that silent flight would also be a big help to an animal that hunts by ear. You can't hear a mouse if you are making too much racket yourself.

Put together the keen eyes, the sharp ears, the hooked beak, all the attributes of that face, add soft silent plumage and talons as the major weapons for capturing and killing prey and you have a sort of generic owl. Real owls are, of course, quite specific, about 134 species, and they have developed a number of variations on this basic theme of owlness.

The barn owl, Tyto alba, *is nocturnal and feeds largely on rodents. Its call is a soft, rising, wheeze.*

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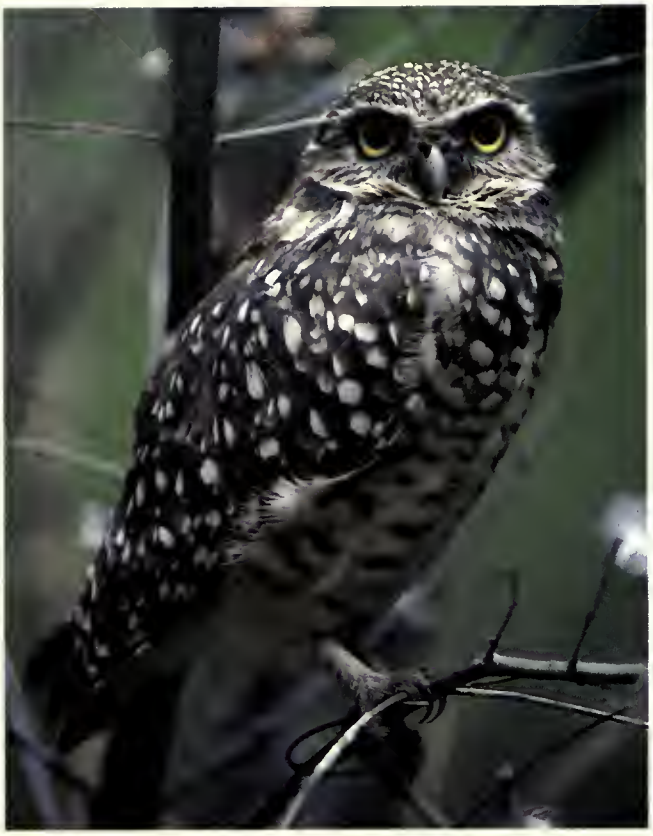
The world's smallest owl is the elf owl of the American Southwest. It is six inches long, about the size of a house sparrow, and weighs less than two ounces. Deciding on the biggest owl is a bit more difficult. The great gray owl, two and a half feet long with a wingspan of five feet, is the longest and widest North American owl, but under all those feathers, the great gray is really a bit on the spindly side. The stockier snowy owl outweighs it by a pound.

The diets of these birds are just as varied as their dimensions. The elf owl goes after grasshoppers and other insects, which it captures owl-fashion with its feet, sometimes while on the wing. Some tropical owls have specialized in catching fish. The undersides of their toes have developed corrugations, a tread for gripping slippery fish. Most owls concentrate mainly on small mammals, from mice and shrews up to rabbits, squirrels, and even skunks.

Owls have occupied all the world's land areas except Antarctica and some isolated oceanic islands. They live in swampy river bottoms in the tropical forest and on Arctic tundra. We have 19 species in North America and 12 of them have been recorded in the Chicago area.



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With some luck, and persistence, you might see seven or eight in the course of a year, but several of those belong to common and widespread genera, so looking at them will give you a good introduction to the whole order.

The barn owl is likely to be the hardest of those local possibilities to find. The genus *Tyto* is cosmopolitan. Antarctica and New Zealand are the only significant land masses without barn owls. However, the birds stay out of the higher latitudes both here and in Eurasia, and in the Midwest the northern edge of their range is central Wisconsin, so we can guess that they were never common here. They were present as resident birds as recently as 30 years ago, but the last nest was discovered 15 years ago, and even sightings of vagrant birds have declined.

Barn owls belong to a family of owls called the Tytonidae which includes them, the closely related grass owls, and the Asian bay owls. The only tytonid in North America, the barn owl differs from all the rest of our owls (the Strigidae family) chiefly in some points of skeletal anatomy such as the shape of the sternum and the thickness of the bones in the eye sockets. There are two visible differences between the barn owls and the rest of our owls. The barn owl's thicker eye sockets produce correspondingly smaller eyes, and the facial disk of the barn owl is heart-shaped rather than round.

Barn owls hunt over open ground. Their wings are long and broad and they can glide quite slowly without stalling. They stay low, rarely rising as high as 15 feet, searching the ground below as they go. This low, slow method of hunting works quite well. One bird in England was seen to capture nine small rodents in 55 minutes of hunting. That's just a bit over six minutes a mouse, an amazing rate, especially when you consider that the bird ate only one and brought the other eight back to its nest. So there were eight flights from hunting ground to nest and back included in that 55-minute span.

When a barn owl sees a mouse scurrying through the grass it dives toward it. Just before striking, the bird swings its feet forward and pulls its head back so that the talons hit the mouse and the head stays away from trouble. As a further protection, the nictitating membrane closes down over the eyes. The membrane is a sort of second eyelid. In most birds, it is thin and transparent, but in owls it is thick and opaque, so at the instant it strikes its prey, the owl is blind.

The only wild barn owl I have ever seen around

Above: *Burrowing owl,* Athene cunicularia, *seen only on rare occasions in the Chicago area.* **Below:** *Long-eared owl,* Asio otus, *recognizable by its large ear tufts, an inch long or more.*

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Barred owl, Strix varia, *nearly as large as the great horned owl, but distinguishable by its lack of ear tufts and its dark eyes, a characteristic it shares locally only with the barn owl.*

Chicago was a very cooperative bird that showed up in Lincoln Park Zoo, of all places, in December of 1982. It hung around for a couple of weeks, roosting in the rafters of the shed that shelters the Viking ship, and birders came from all over to see it.

It is depressingly easy to assign causes to the decline of the barn owl. We don't have as many barns as we used to, and those we do have are probably too spruce and tidy to have a hole in the wall big enough for a barn owl to get through. We also don't have as many pastures and hay fields as we used to for the birds to hunt over. The Illinois Department of Conservation has begun putting out nest boxes for barn owls, but with so few birds left, it is hard to see where the breeding stock is going to come from.

The easiest owl to see around Chicago is *Bubo virginianus,* the undisputed king of the woods, the great horned owl. This voracious hunter nests in every county in the Chicago area. It is possible that it breeds in every county in the U.S. outside of Hawaii. It regularly nests within the city limits of Chicago.

A large female great horned owl—as in hawks and eagles, female owls are generally larger and heavier than males—might measure two feet from top of feather tufts to tip of tail and its wingspan could reach five feet. Pound for pound, it is the fiercest predator in North America. Only the wolves, bears, and pumas regularly

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Snowy owl (Nyctea scandiaca)

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Great horned owl, Bubo virginianus, *found throughout the continental U.S. except northernmost Alaska. Its call is commonly a loud* hoo-hoo, hoo-hoo, hoo, *but it also utters a variety of unearthly screams.*

take prey larger than this mighty owl. Just naming the animals it is known to eat would take half this page. The roster includes skunks, possums, snowshoe hares, large snakes—including poisonous species—and a long list of birds ranging in size up to the Canada goose. Like most owls, the great horned is not much for nest building. It often takes over the old nests of red-tailed hawks. If the hawks try to protest this usurpation they are likely to lose the contest. Red-tailed hawk is one of the birds on that long list of food items for the great horned owl.

Great horned owls begin nesting as early as the end of January around Chicago. They are most vocal during the breeding season, so late winter is a good time to look for them. The sheer arrogance, if I may anthropomorphize for a moment, of nesting in January, seems to fit a bird as mighty as the great horned owl. Just when most animals are pressed to the limit to survive, the owl decides to start a family.

The female lays her clutch—usually two or three eggs—and then sits on them for a month or more. She has to stay on the nest, because even a short absence on a cold February night could kill the developing embryos. So the male hunts for two, somehow finding enough for both his mate and himself through the most miserable and difficult time of year.

After the young hatch, the parents combine their efforts, delivering rabbits, squirrels, woodchucks, ducks, skunks and almost anything else that moves. The young birds stay with their parents through the summer, following them through the woods, often screaming loudly to be fed. They don't become fully independent until fall, which may offer a more reasonable explanation than arrogance for that early nesting date.

Great horned owls nest from Hudson Bay to Tierra del Fuego at South America's tip. Other members of the genus *Bubo* live in Asia, Africa, and Europe. Most of the Old World species are called eagle owls in recognition of their size and strength.

Barred owls are almost as big as great horned owls, but their feet are noticeably smaller and weaker. In an owl, small feet mean small prey. Barred owls live mainly in low, swampy woodlands, and much of their food is frogs, salamanders, and small snakes. In the Chicago

Short-eared owl, Asio flammeus, *is most often seen during spring and fall migrations, particularly in prairie or marshland.*

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Boreal owl, Aegolius funereus

area, they can usually be found along the Des Plaines River in Lake County and at the Indiana Dunes, but not in between those two places.

The barred owl is the classic hoot owl. You can learn to imitate its standard nine-note hoot, and if you get halfway decent at it, you can call a bird right out of the woods.

Common screech owls are our most common local

owl. They are really misnamed. Their usual call is a sort of eerie whinny rather than a screech. This is another one you can learn to imitate without too much difficulty. Screech owls will come when they are called, and many species of small songbirds will also respond. Many birds mob predators such as owls. They don't dare attack an owl, but they will crowd around it and holler at it as loudly as they can. It seems an effective way to neutralize a hunter that depends on stealth.

Screech owls are our smallest resident owls. They are typically robin-sized—8 to 10 inches long, with a wingspan of 18 to 24 inches—or even smaller, so they go for smaller prey than the great horned; but their tastes are just as catholic. Among the food items they are known to take are other screech owls.

Our screech owls belong to the genus *Otus*, a group whose many species are distributed world-wide. Among the screech owl's relatives is *Otus petersoni*, recently discovered in South America by John Fitzpatrick of the Field Museum and John P. O'Neill of Louisiana State University.

Long-eared and short-eared owls, both of the genus *Asio* are also quite cosmopolitan species. The long-eared lives in mid-latitudes in both eastern and western hemi-

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Great gray owl,
Strix nebulosa

spheres. The short-eared is even more widespread. It lives in North and South America and in Europe and Asia and on several isolated islands, among them Hawaii and the Galapagos.

The two birds are approximately the same size, averaging about 15 inches long with wingspans of three to three-and-a-half feet. Both of these birds used to be regular nesters in the Chicago area, but they have grown scarce in recent years and now we see them mainly during migration and in winter. Short-eared owls are sometimes seen migrating along the lakefront, and in suitable habitat—marsh or grassland—you may see one hunting during the day. Like the barn owl, they fly low across the fields looking for movement in the grass.

Snowy and saw-whet owls are northern species that we see here fairly regularly in the winter. The giant snowy owl is an irruptive species. Some years we see very few; but from time to time, the lemmings that are one of the owl's major food sources suffer a population crash, and large numbers of owls then come south in search of food. In peak years, they have been known to reach the Gulf Coast.

The saw-whet, the smallest of our owls, measures 7 to 8 inches end-to-end and its wingspan is only 17 to 20 inches. Saw-whets are very tame birds, so if you can find one you may be able to get quite close to it.

If you have real faith in long shots, you might hope to see a burrowing owl. This is a species with a disjunct population. Most of them live in the Southwest, but there is also an isolated population in Florida. We don't know where our local sightings came from, but we have only about 10 records of the bird in the past 60 years, so if you see one, you should think about the fact that you are probably having a once-in-a-lifetime experience.

However, neat though it would be to see a burrowing owl, there are even rarer experiences possible for the lucky and assiduous owl-seeker.

Perhaps you will see a boreal owl, a species that has been reported only four times in the Chicago area. Or a hawk owl, seen four times for certain, most recently in 1914, and once, possibly, in 1977. That presumed sighting of ten years ago was enjoyed by only one person. You might even see a great gray owl, a bird listed by Chicago's early naturalist, Robert Kennicott, in a compilation of birds found in Cook County that he published in 1855. It hasn't been seen since.

These extreme longshots carry a bigger charge of excitement, not just because they are rare in these parts but because they live in inaccessible places and they aren't all that easy to see even there. If you really want to see burrowing owls, you can fly to Florida, Texas, Arizona, or various other states, and see lots of them. You might not even have to get off the plane. They nest in the artificial short-grass environments of airports.

But great grays and hawk and boreal owls are birds of the northern forests. With the exception of a few southern extensions in the western mountains—great grays breed in Yosemite National Park in the Sierra Nevada—their breeding range in the New World is entirely in Canada and Alaska. They are likely to be uncommon even on their home ground, so you could travel for days through the wilderness of, say, northern Ontario, and never see one.

These three woodland owls are also much more sedentary than the semi-migratory snowies, staying put in winter; or, if they do come south, they don't venture far. The winter of 1978-79 saw a great invasion of great gray owls into the U.S., but few of them got south of Duluth, Minnesota.

The giant great gray owl has one of the most highly developed facial disks. Its fluffy feathers cover even its toes, a useful trait in an animal that routinely winters in northern Saskatchewan.

The boreal owl is the smallest of this trio. It is screech owl-size, about 10 inches long. Like the saw-whet, it is extremely tame. People have actually captured boreal owls by hand.

Hawk owls are a special case. They have gone diurnal, left the night to hunt during the day, and their way of life has pushed them in some hawkish directions. Their wings—the average span is a few inches under three feet—are slender and pointed like a falcon's and their flight is fast and direct. They use their eyes more than their ears, and their ears are smaller and more symmetrical than those of more nocturnal owls. Their feathers are also noisier; they have lost the velvety cushioning typical of the rest of their family. FM

Northern hawk-owl, Surnia ulula

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Dave Walsten

Volunteers Bette Jarz (left) and Trace Clark-Petravick process the Schrammen fossil sponge collection, unpacking and cataloging specimens, preserving accompanying documents, and translating labels from the German. Volunteer colleagues in this valuable work are Susan Brown Roop and Lori Welsh. 84662

Absorbed in Sponges

by MARY R. CARMAN and SUSAN BROWN ROOP

Sponges, simple and primitive though they may seem, have proven to be remarkably successful animals, surviving all of the major extinctions that are part of the earth's history since they first appeared nearly 600 million years ago.

These interesting animals have succeeded in space as well as time, occurring in every major ocean basin, from abyssal depths to the tidal zone, as well as in freshwater lakes and streams. In some environments they are the dominant organism.

Mary R. Carman is manager of the paleontology collections; Susan Brown Roop is a volunteer in the Department of Geology.

Fossil sponges are of particular interest to geologists, who have used them to interpret ancient environments. Among the most important collections of fossil sponges is that acquired over a period of more than fifty years by the German collector Anton Schrammen (1869-1953). During the last 18 years of his life, Schrammen gradually sold off the collection to Princeton University, from which it was recently acquired by the Field Museum.

A dentist by profession, Schrammen's greatest contribution to science was through his avocation: the study of fossil sponges, particularly those of the Jurassic and Cretaceous periods (215-145 million years ago and 145-65 million years ago, respectively). His collection is particularly rich in Cretaceous type specimens (those individuals on which original descriptions of species are based).

As a young man, Schrammen collected specimens from fossil beds within a ten-mile radius of his hometown of Hildesheim, about 100 miles south of Hamburg. In the 1890s he intensified his paleontological work, gradually going further afield to collecting areas near Braunschweig, Münsterland, and Oberschlesein—areas particularly well known to invertebrate paleontologists. By chance or good fortune, Schrammen was living in the heart of prolific fossil country.

Schrammen prepared his own sponge specimens and perfected methods of cleaning them, etching with acid and using needles to painstakingly scrape away the matrix, grain by grain. He did independent research at the Roemer Museum in Hildesheim, with the advice and encouragement of Professor Karl A. von Zittel, then the world's leading authority on fossil sponges and chairman of paleontology at the University of Munich. For his scientific contributions, Schrammen was awarded an honorary Ph.D. in natural science from Tübingen University in 1912, during what has been called *die Blütezeit der deutschen Paläontologie*—"the flowering time of German paleontology." He wrote 18 scientific papers on fossil sponges between 1899 and 1948.

Schrammen's remarkable collection first came to this country as an addition to the paleontological holdings of Princeton University, thanks to the guidance and perseverance of Professor Benjamin Franklin Howell (1890-1976), Curator of Paleontology at the Princeton Museum. Between 1937 and 1955 Princeton acquired the collection in installments. Although the two men never met, they corresponded from 1935 until Schrammen's death, 18 years later, except for the World War II years when their communication was interrupted. The letters, which have been kept for their archival value, provide interesting historical footnotes to those turbulent years.

Anton Schrammen (1869-1953). 85035

Howell's first contact with Schrammen came in 1935 when he sent a fossil sponge for identification, as Schrammen had long been recognized as an expert in this field. Along with Schrammen's response came an offer to sell some of his Upper Cretaceous fossil specimens. Howell jumped at the chance to acquire the valuable material, and the purchase was negotiated two years later with funds provided by Princeton University and the Academy of Natural Sciences of Philadelphia. Schrammen followed this sale with an offer to sell the other major part of his collection, the Upper Jurassic material.

Following the war, Schrammen was again in touch with Howell, seeking food goods as partial payment for his specimens, since many basic food items were still hard to come by in war-ravaged Germany. In a letter dated April 1946, Schrammen specifically requests tea, coffee, cocoa, lard, or sausage; but since Hildesheim lay within the British Zone of Occupation, food parcels could not be sent to him from the United States. Five months later, as restrictions eased, the embargo on such goods was lifted, and Howell was able to send CARE packages to Schrammen.

Princeton Curator Benjamin F. Howell, who first wrote Anton Schrammen in 1935. Their correspondence continued (except for the war years) until Schrammen's death in 1953. Photo courtesy Princeton University Department of Geological and Geophysical Sciences.

Every kind of container from anchovy tins to photographic plate boxes was used to package the Schrammen material. These were then packed into crates, such as the one in back, for transatlantic shipment. Photo by Ron Testa. 85037

Food and money were, in fact, continual requests of Schrammen's, but Howell's ability to respond as he would like to the German's needs was limited by budget cuts at Princeton; in any case, because of federal regulations, no money could be sent. Howell found the means, nonetheless, to send Schrammen food parcels through U.S. government channels, and twice a month, from September 1946 through October 1948, packages were sent, though a constant problem was the disappearance of parcels en route. Schrammen's letters, in turn delayed by the Office of Censorship, revealed that his crowded household included his wife, his daughter, a sister-in-law, a granddaughter, and a great-grandchild.

In July 1947, the U.S. military government approved Schrammen's request to sénd paleontologic specimens to Howell as a commercial transaction. Two years before that, the same office had issued a declaration that the "very fine paleontologic collection that occupies two or three rooms in Dr. Schrammen's house is free from any impositions, . . . his house will not be requisitioned." Among the 1948 food parcels, Howell included four new pairs of shoes for the family members, one pair per parcel, in the hope that some might find their way to the Schrammen family. In due course, and despite all difficulties, the fossils arrived at Princeton and food and shoes arrived at Schrammen's home.

Schrammen had also reported that his financial reserves were wiped out by the *Währungreform*—"currency reform." So a letter from Howell in the fall of 1948 was especially welcome: money could now be sent to German citizens. Accordingly, Princeton initiated payments, at first small, in order to test the reliability of transmitting funds via the American Express Company — the procedure advised by UNESCO. By the time of Schrammen's death in 1953, some of the specimens were still in Hildesheim. By 1955 Princeton had received the entire collection, with payments to his widow continuing until 1963.

In 1985, when Princeton's Department of Geology divested itself of most of its paleontological collections, the Schrammen material was offered to the Field Museum, and Scott Lidgard, Field Museum's Assistant Curator of Fossil Invertebrates, arranged for its acquisition. That summer, some 6,000 specimens were trucked from New Jersey to Chicago. A portion of the collection was still in ten original crates that had arrived from Hildesheim three decades earlier — crates that had never been opened. The whole collection, then, had never been formally processed.

Under the direction of Paleontology Collection Manager Mary R. Carman, volunteers Susan Brown Roop, Trace Clark-Petravick, Bette Jarz, and Lori Welsh have been involved in the long-term project of unpacking and repairing the material, translating the German script labels, preserving the accompanying journals, uncompleted manuscripts, the Schrammen-Howell correspondence and other letters and documents, and cataloging the specimens. It is expected that the entire project will be completed by the end of this year. The specimens acquired by Anton Schrammen comprise a rare and valuable addition to Field Museum's paleontological collections.

Bushman *continued from p. 6*

Now that the feeding problem was solved, how would the missionaries keep the baby warm during the long, cold African night? A mother gorilla holds her infant during each night. James Allen finally located a young African woman who volunteered to hold it close to her as it slept.

The young gorilla grew rapidly. The personnel in the Presbyterian Mission compound loved him and taught him little tricks, such as how to ride a kiddy car and how to comb and brush his hair while holding a mirror.

One day a visitor from the United States stopped at the compound and bought the little animal for $500. Back in the United States, he sold him for $3,500 to Chicago's Lincoln Park Zoo, where he was given the name "Bushman."

Dr. Johnson passed the $500 check on to Allen, a professional architect doing missionary work, who used it to commission a stained glass window for the Presbyterian church he had just built in Yaounde. After a long and careful search, James and Annie Mary found the stained glass window maker they were looking for in Wheaton, Illinois. During this trip, Allen also visited Bushman at Lincoln Park Zoo, and the animal responded excitedly as he heard Allen speaking the familiar Cameroon dialect. Allen stayed in the primate house that evening until after closing hours as the two romped and played together.

Allen's career was to be short-lived. About two years later he died in Africa from an infected insect bite. Annie Mary returned to the United States with their infant son and daughter.

FIELD MUSEUM TOURS

Explore the primeval splendor of the Canadian Northwest.

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PROJECT CANADIAN FJORDS & INSIDE PASSAGE

Departing:
August 16, 9 Days

August 16, Seattle. Arrive and transfer to our deluxe hotel. After a reception at the University of Washington's Burke Museum, enjoy dinner and Seattle's nightlife.

August 17, Prince Rupert. Depart Seattle on morning flight to Prince Rupert. After a ferry crossing to Prince Rupert, board the *Society Explorer* for an evening departure. Enjoy the captain's welcome dinner as we set sail at sunset for the Queen Charlotte Islands.

August 18-19, Queen Charlotte Islands. Journeying south, we arrive at the unspoiled home of the Haida Indian Nation where braves erected countless totem poles, each carved to tell its special story. Today these moss-encrusted monuments testify to the centuries-old Haida way of life. We explore these islands with their brooding forests harboring ancient villages. Bald eagles, seabirds, Stellar sea lions and whales provide opportunities for rewarding walks and beach hikes.

Society Explorer

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

August 20, Fitzhugh Sound. This morning we sail into the upper Fraser Reach and Grenville Channel for a day of exploration among the magnificent wave-sculpted canyons and craggy inlets of the Canadian fjords. At Kwakshua Inlet, an area rich in abalone and other Northwest sea life, hikers will enjoy exploring the coastal woods of 100-foot stands of red cedar, Sitka spruce, western hemlock and Douglas fir. Our ship sails south into a region of towering cliffs, and rushing waterfalls.

August 21, Alert Bay. Following an afternoon cruising the Inside Passage, our ship puts in at Alert Bay, ancestral island home of the Nimpkish, largest tribe of the powerful Kwakiutl Indian Nation. According to anthropologist Franz Boas, the word Kwakiutl means Smokes of the World, which alludes to their ability to attract huge throngs of people to their firelit potlatches and ceremonials. We'll visit the U'mista Cultural Center/Alert Bay Museum. Here we see fine examples of the distinctive ceremonial masks, utensils and bentwood boxes—important elements of the rich Kwakiutl lifestyle—and have the opportunity to purchase native handicrafts, jewelry and artwork.

After lunch, we'll move into the Queen Charlotte Strait, the summer gathering place for close to 300 killer whales, uncontested top predators of Canada's northern waters. Roaming the protected waters of the Inside Passage in clearly defined pods, males, females and young cooperate in hunting their prey. Killer whales have no natural enemies other than man.

August 22, Princess Louisa Inlet. Passengers experience a realm of snowmelt cascades and 6,000-foot mountains ringing this spectacular horseshoe-shaped fjord. Overhead, bald eagles soar, slicing through the coastal mists with their six-foot wing-spans. At the tumultuous Chatterbox Falls, we'll go ashore to walk alpine meadows full of lupine, dwarf dogwood and chocolate lily. Others may follow the trail which ends at the long abandoned Trapper's Cabin, built in the shadow of scenic Mt. Albert.

August 23, Victoria. Midday arrival in Victoria, British Columbia. Victoria's distinct English flavor is reflected in the copper-domed Parliament buildings heralding our entry into the harbor. This afternoon we tour the Provincial Museum with its comprehensive collection of coastal Indian art and artifacts and its life-sized replica of a 19th-century frontier town. Stroll the cobbled streets, perhaps stopping to sip tea at the ivy-covered Empress Hotel. The captain hosts a farewell dinner tonight as we sail for Seattle.

August 24, Seattle. Morning arrival and connection with homeward flights.

This tour will be enhanced by a team of expert lecturers in the region's natural history, native cultures, and wildlife, including *Dr. Scott M. Lanyon,* Field Museum's assistant curator and head of the Division of Birds.

CRUISE COST PER PERSON

Explorer	$1,790	Boat Deluxe	$2,690
Explorer Deluxe	$1,950	Suite	$3,190
Yacht	$2,320	Owner's Suite	$3,590
Yacht Deluxe	$2,490	Airfare (not incl. in rates)	$190

Rates are per person, double occupancy, and include group transfers, cruise accommodations, all meals including a welcome cocktail and dinner party and farewell dinner, lectures by accompanying or visiting speakers, and all off-ship excursions. Amenities include travel bag, backpack, documentation wallet, comprehensive guide book and daily log. Single cabins are available at 1.5 times the above rates, except single suites which are 1.9 times the above rates. Airfare is approximate and subject to change.

Deposit $500.000 per person

People's Republic of China

18 Days

September 16 – October 3, 1987

Customized Tour exclusively for Field Museum
Organized and accompanied by
Katharine Lee

Stanton Cook, courtesy *Chicago Tribune*

The itinerary for this exceptionally well conceived tour covers the highlights of this fascinating country. We depart Chicago via Japan Air Lines. Our first stop will be Tokyo, where we will enjoy a city tour. Chinese cities to be visited include Shanghai, Wuxi, Beijing, Luoyang, Xi'an, and Guilin, plus a boat ride on the Li River. We'll exit through Hong Kong, a city full of Oriental treasures and cultural heritage. This is a "not to be missed" opportunity.

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

March 1987

Stories and Myths from Around the World

performed by

The Young People's Company of the Piven Theatre Workshop

Saturday, March 14

see page 3

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COVER

WATER SNAKES, that's right, water snakes are the subject of this March view of the big pond in Indiana Dunes State Park, an hour's drive southeast of Chicago. For with the first suggestions of spring, these creatures, nestled in protected nooks along the pond's edge, may already have urges to stir, as may the turtles, frogs, fish, and other aquatic and semiaquatic creatures that call the bog their home. Nine water snake species, some common, some rare, occur in the Chicago area. For more on these elusive (and harmless) reptiles, see John Murphy's article, pages 11-16. Photo by D. Walsten.

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Events

Stories and Myths from Around the World

The Young People's Company of the Piven Theatre Workshop

Saturday, March 14, 2:00pm, James Simpson Theatre

WATCH THE YOUNG PEOPLE'S COMPANY weave a spell of Magic with "Stories and Myths from Around the World." This delightful collection takes you to the four corners of the earth. The afternoon begins with a tale about a mythical Indian maiden who is rewarded in the afterlife for her goodness and truthfulness. In the Far East, we join a couple embarked on a perilous journey to cure the bluebird who has suddenly stopped singing. At journey's end they find that all birds have been turned to stone. In "The Beggar and the Gazelle" a man from the Middle East learns about the importance of being a faithful friend. A weaver, and a mysterious spider web conclude this charming quartet of Tales.

The Young People's Company of the Piven Theatre Workshop has been performing for twelve years. Directed by Joyce Piven, this enchanting group is composed of 15 young people between the ages of 15 and 18 years.

This performance is recommended for adults and children age 6 and older.

Tickets: $7.00 ($5.00 members). To order tickets, see coupon on next page.

Continued →

Events

March Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the museum are designed for families and adults. Listed below are just two of the numerous activities each weekend. Check the *Weekend Programs* sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

☐ Saturday, March 7, 1:30pm *Tibet Today* (slide lecture). See Lhasa and other towns now open to tourists and Bhutan—"Land of the Thunder Dragon."

☐ Sunday, March 15, 2:00pm *Traditional China* (tour). Examine the history and lifestyles represented by Chinese jades and other masterworks.

☐ Sunday, March 29 2:00pm *Treasures from the Totem Forest* (tour). A walk through Museum exhibits introduces the Indians of southeast Alaska and British Columbia, whose carved totem poles and masks proclaim their pride of rank and their mystical ties to animals and spirits.

World Music Program

Saturdays and Sundays in March
1:00pm and 3:00pm

MUSIC COMMUNICATES many different things to many different people. It is something that can be shared by all of us, whether or not we have common lifestyles, beliefs, even languages. Experience with us the music of different cultures.

☐ March 7, 8: *Lincoln Beauchamp* at 1:00pm
Shanta Nurullah at 3:00pm

☐ March 14, 15: *Phil Cohran* at 1:00pm and 3:00pm

☐ March 21, 22: *Raices del Andes* at 1:00pm and 3:00pm

☐ March 28, 29: *Don Moye* at 1:00pm and 3:00pm

The World Music Program is supported by Kenneth and Harle Montgomery in honor of E. Leland Webber, president emeritus of Field Museum.

Registration for "Stories and Myths from Around the World"

Be sure to complete all requested information on the ticket application. If your request is received less than one week before a program, tickets will be held in your name at the West Entrance box office. Please make checks payable to Field Museum. Tickets will be mailed upon receipt of check. Refunds will be made only if the program is sold out.

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Address

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Telephone: Daytime Evening

"Stories and Myths": Tickets—Members $5.00, Nonmember $7.00

Member Tickets #Requested	Nonmember Tickets #Requested	Total Tickets Requested	Amount

Have you enclosed your self-addressed stamped envelope?

Events

Edward E. Ayer Series

Thursdays in March, 1:30 pm
These programs are free

March 5
The Wonders of Ancient Egypt
Frank Yurco, Doctoral Candidate in Egyptology, University of Chicago

The shadows of Egypt's mysterious and glorious past still fascinate the visitor to her cities and historical monuments. Travel back through time to this land of ancient pyramids, tombs, and ancient ruins.

March 12
Canadian Holiday: A Trip Around Gaspé Peninsula
Carolyn Dring, Naturalist

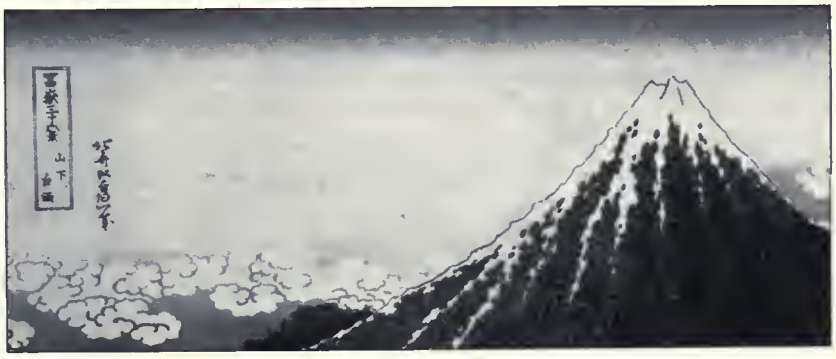
Canada's northeastern provinces are home to some of the most scenic parks in North America. From Bay of Fundy to Cape Breton Island follow the seascapes that are awash with migratory birds.

March 19
China's Great Cities
Hau Kum Kneip, Instructor, Continuing Education Division, City College of Chicago

Mainland China is opening more and more to the world. Its cities reveal both China's future and its ancient culture. Enjoy this journey through the eyes of an experienced traveler.

March 26
The Culture of Japan
Kazuko Ernst, Master, Ohara School of Ikebana

Despite European and Western influence, Japanese culture remains rooted in its history and traditions. Experience and enjoy the subtle beauty of Japan's enduring culture through a look at her arts, ceremonies, and foods.



THE ATHAPASKAN HUNTING CANOE

by James W. VanStone
Curator, North American Archaeology and Ethnology

Among the bark-covered watercraft employed by North American Indians, the so-called kayak-form canoe is perhaps the least familiar. It was primarily a hunting craft used by Athapaskan Indians on the rivers of interior Alaska and northwestern Canada and was light enough (about 40 lbs.) to be easily portaged. These vessels ranged in length from 12 to 18 feet and in beam from 24 to 27 inches. They were extremely shallow, the depth seldom exceeding 12 inches. In addition to hunting, this type of craft was also used for transporting a family and its possessions from one place to another. Such cargo canoes were longer (22 to 24 feet) but the basic construction was the same.

The kayak-form canoe had largely disappeared before the advent of modern ethnographic fieldwork and they are known primarily from early photographs and examples in museum collections. At one time the collections of Field Museum contained three full-sized Athapaskan canoes that had been obtained in Alaska along the Yukon River for the 1893 World's Columbian Exposition. Regrettably, these have long since disappeared, but the collections still contain three model canoes collected in the same area at about the same time, and these models make it possible to understand the major aspects of canoe construction. Also helpful are historical photographs showing kayak-form canoes in use and descriptions obtained by ethnographers from elderly Indian informants in the 1920s and 1930s.

The manufacture of Athapaskan kayak-form hunting canoes was one of the most complicated procedures in Athapaskan technology. The builders prepared most of the several parts before they attempted to assemble the canoe as a whole. Constuction of a hunting canoe usually began with preparing birch bark for the cover. Birch trees with bark suitable for canoes had straight limb-free trunks. Ideally the sheets of bark were equal in length to the canoe and only three were required. The thickest sheet, turned up along each side, went on the bottom, which was flat and diamond-shaped, though exceedingly elongated. Two more long pieces were then applied, one on each side and overlapping the turned-up edges of the bottom piece.

A floor rack, forming the bottom of the canoe, consisted of two outer longitudinal pieces, three or four inner longitudinal pieces, and three or more crosspieces. All of these were made from straight-grained green spruce. The bow and stern posts were then fashioned from a large root near the base of the spruce tree trunk.

Each canoe had a pair of gunwales cut from straight-grained green spruce, the rough work being done with a stone adze and the trimming with a beaver tooth chisel. The gunwales, extending from the top of the bow post to the top of the stern post, were held apart by four to six thwarts. A photo taken at Anvik, an Athapaskan village on the lower-middle Yukon River, in the early years of this century, shows a canoe at this stage in its construction. The completed floor rack is shown at one side (fig. 1).

James W. VanStone, Field Museum's curator of North American archaeology and ethnology

Dave Walsten

Fig. 1

National Anthropological Archives, Smithsonian Institution

A pair of longitudinal side pieces equal in length to the canoe were inserted on each side and held in place by 11 to 13 ribs cut from flexible green spruce. The center ribs were larger, with a broad U shape, while those both fore and aft were smaller, becoming almost V shaped. The bow of the canoe, to a length of about two feet, was decked with a single piece of bark lashed to the gunwales or held in place on each side with narrow strips of wood pegged to the gunwales. All the lashing was with spruce root and the canoe was completed by applying a coat of spruce gum on all the seams and holes of the bark cover.

Ethnographers who interviewed Indian informants on the Yukon River in the early 1930s were told that one man, with reasonable minimum cooperation from his family, could put the various parts of a canoe together in about five days. To make the frame and prepare the bark, of course, took much longer. Other factors controlling the construction time were the craftman's skill and the weather.

The three model kayak-form canoes in the Museum's collection appear to be accurate as far as construction is concerned, but they may not correctly reflect the extremely shallow draft of these vessels as depicted in historic photos. Also, each is covered with only one piece of bark, instead of the three customarily used for full-sized canoes.

The largest of these models is 47½ inches long with a beam of 7 inches. There are six thwarts and 15 ribs. In the center, lashed together with spruce root, are floor boards on which the paddler would kneel or sit. The bark decking, held in place on the sides with strips of wood pegged to the gunwales, is ornamented with what appear to be simulated animal tracks in dark brown pigment (figs. 2A,B).

The second model canoe is 32 inches long with a beam of 6 inches. There are six thwarts and eight ribs. Faintly visible on the bark decking is a hunting scene consisting of a hunter holding a bow and arrow, and four unidentified animals each with an arrow through its body (figs. 2C,D).

The third model is 22½ inches long with a 4½-inch beam. There are nine ribs and originally four thwarts (one is missing). The thwarts and spruce-root lashing on the gunwales are ornamented with black pigment. On the bark decking is a series of dots and a fishlike creature in black pigment. The floor rack is clearly visible in this model (figs. 2E,F).

Kayak-form canoes have been described by elderly Yukon River Indians as extremely unstable and capable

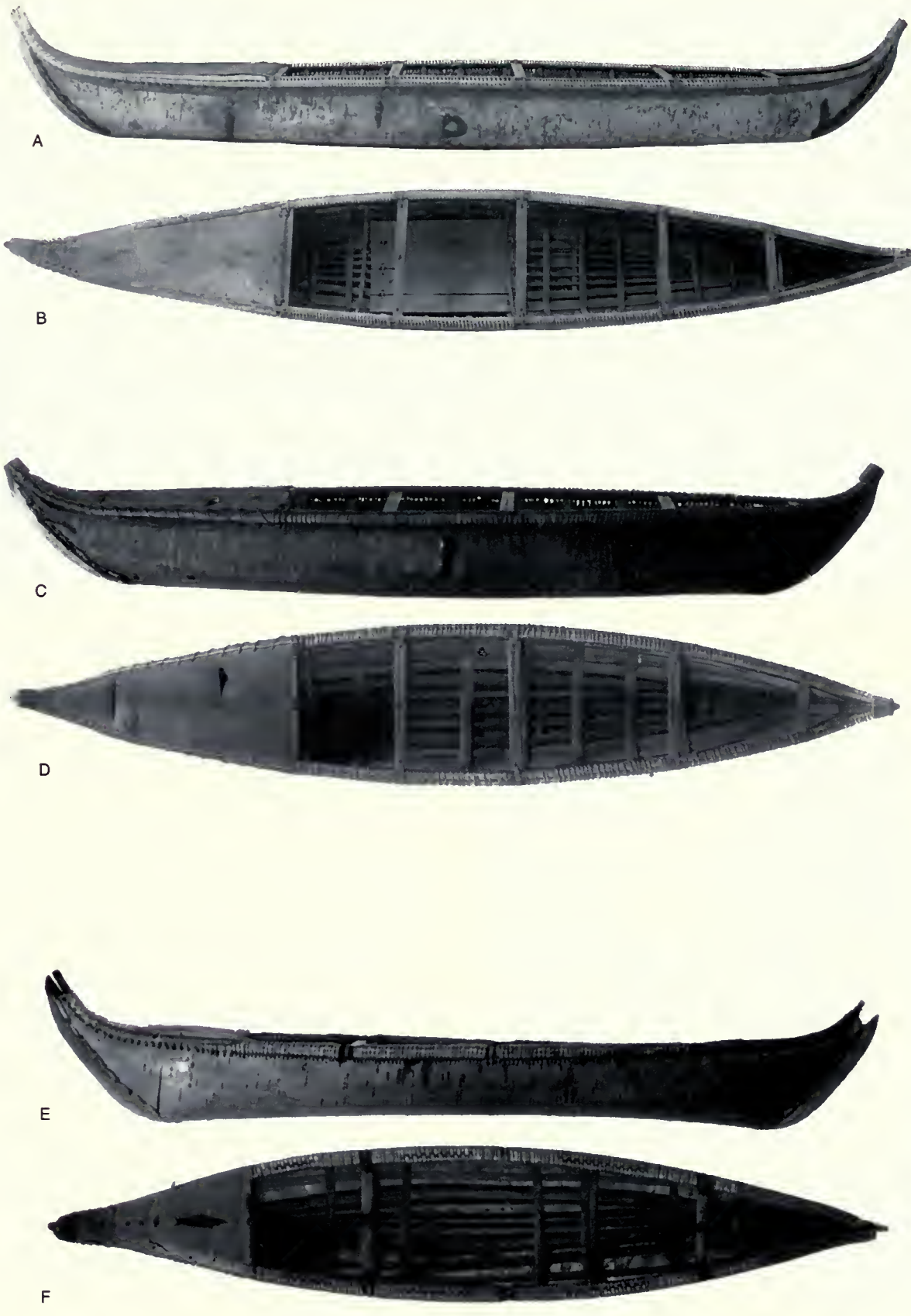


Fig. 2

Photo negatives (from top). 110268, 110268, 109178, 109177, 109178, 109177
Photos 2A, 2B by Diane Alexander White, photos 2C, 2D, 2E, 2F by Ron Testa

National Anthropological Archives, Smithsonian Institution

Fig. 3

National Anthropological Archives, Smithsonian Institution

Fig. 4

of holding one or two persons. The canoeman stepped into his vessel by first grasping both gunwales with the hands while placing one foot in the center of the floor boards. He then either knelt in the bottom of the boat or sat with his legs folded akimbo, controlling the tipping of his fragile craft largely through his knees. Paddling was done by taking a few strokes on one side alternately with strokes on the other and without touching the gunwale. A typical paddle had a crutch handle and measured seven feet overall, the pointed blade was approximately two feet long and five inches wide. A pronounced keel ran along one side of the blade. The keel side was held to the rear when paddling.

Hunting canoes similar to those described above were used by practically all Athapaskan-speaking peoples. The Yukon River canoes are said to have been lighter and more graceful than those used in the Mackenzie River drainage. A well-made Yukon River canoe could last as many as seven seasons, a poorly made canoe only one. Presumably the test came with the cold water of fall, which cracked bark of poorer quality.

In addition to its use for hunting, the kayak-form canoe served for fishing and for visiting fish traps and nets. Three photos reproduced here show hunting canoes in use in the late nineteenth and early twentieth centuries and were taken near the village of Anvik. In the first photo, two men are dip net-fishing for silver salmon. They are drifting downriver with the current while holding long-handled nets in the water. When an ascending salmon was caught, it was lifted out, killed, and placed in the boat; then the operation was repeated. Good balance was required to stand in these extremely narrow, tippy vessels handling a heavy netted fish (fig. 3).

Fig. 5

National Anthropological Archives, Smithsonian Institution

In the second photo a man is checking a fish trap (fig. 4). The shallow draft of his kayak-form canoe may be clearly seen, a characteristic also indicated in the third photo, in which a hunting canoe is shown next to a decked wooden river boat of approximately the same length (fig. 5).

Kayak-form canoes were in use on the Yukon River and its tributaries as late as the 1920s, but by that time these vessels were covered with canvas rather than birch bark. They were replaced by narrow wooden river boats which, after about 1918, were propelled with gasoline-powered outboard motors. These useful machines greatly affected the mobility of the Indians throughout the entire season when the Yukon and its tributaries were ice-free. It would be difficult to imagine a more successful and practical innovation than the outboard motor. With it all summer and fall subsistence activities were facilitated and the arduous efforts associated with river transportation were eliminated. FM

Note

Additional information on Athapaskan hunting canoes can be found in *Ingalik Material Culture*, by Cornelius Osgood (Yale University Publications in Anthropology, no. 22, 1940) and *The Upper Tanana Indians*, by Robert A. McKennan (Yale University Publications in Anthropology, no. 55, 1959).

Field Museum's Tenth Annual Spring Systematics Symposium

"Evolutionary Ideas of Progress"

Saturday, May 9

Speakers

Francisco J. Ayala
Roy J. Britten
Robert Dunnell
Stephen J. Gould
David L. Hull
William Provine
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Water Snakes

That You Might See Around Chicago

by John C. Murphy

photos by author
except where noted

A good many Chicago-area residents, I suspect, have spent their entire lives here without having sighted a real live snake; and that probably suits them just fine. Those who appreciate snakes and have no fear of them are, unfortunately, among the minority. All but one of the seventeen species of snakes that now occur in Cook, Lake, DuPage, Will, Kankakee, and McHenry counties are harmless to man. The single exception is the eastern massasauga, a rattlesnake, which in any case is highly local in distribution. Snakes are not only beneficial, and a key to a balanced ecosystem, they also tend to go about their own business, preferring to keep a very low profile (no pun) in the environmental scene. In the following essay, John Murphy tells us just about everything we ought to know about local water snakes, which make up nine of the seventeen snake species occurring here. * *Mr. Murphy teaches biology at Plainfield High School, Plainfield, Illinois and has served as herpetology consultant for agencies such as the Illinois Department of Transportation and for the government of Trinidad and Tobago.* —Ed.

Northern water snake, Nerodia sipedon sipedon

A Field Museum Feature
On Local Natural History

*The other eight snake species in the Chicago region are the eastern hognose snake *(Heterodon platyrhinos)*, the western smooth green snake *(Opheodrys vernalis blanchardi)*, the eastern yellowbelly racer *(Coluber constrictor constrictor)*, the black rat snake *(Elaphe obsoleta obsoleta)*, the western fox snake *(Elaphe vulpina vulpina)*, the bullsnake *(Pituophis melanoleucus sayi)*, the eastern milk snake *(Lampropeltis trianqulum trianqulum)*, and eastern massasauga *(Sistrurus catenatus catenatus)*.

Most snake species that you are apt to come upon in the Greater Chicago area belong to a group known as natricines (formally the subfamily Natricinae), better known as water snakes. Though some of these nine species are seldom seen, even by herpetologists who search for them, the group as a whole is abundant and, in the warmer months, are easily observable by anyone who knows where to seek them out.

Nerodia: The Northern Water Snake

The **Northern water snake** *(Nerodia sipedon sipedon)*, when full grown, is 23 to 42 inches (61-107cm) long, the record being 53 inches. Females are generally larger than males, but the male's tail is proportionally longer. The color and pattern are variable, but usually the upper surface is brown-black, with more than 30 bands and spots that are lighter in color. The lower side of the body is often yellow, with paired dark half-moon blotches on each ventral scale. The scales are heavily keeled, and adult males usually have knobs on the dorsal scales in the anal region. As adults mature, the light-colored bands often darken, and a snake with dry skin may appear to lack a pattern completely; however, the pattern frequently appears when the snake is placed in water.

Wherever water and shoreline vegetation are available, this snake can usually be found. Winter hibernation may occur under stream embankments, in rock piles, or animal burrows. Depending on the weather, the snake may be active until late October but it may venture out of the hibernaculum, or winter quarters, on warm November-December days. January and February are spent in torpor, which is broken with the warming temperatures of March. Warm spring temperatures raise the snake's body temperature enough so it can become active for hunting and mating.

Fish make up most of the northern water snake's diet. A study of a Kentucky population of this species showed that 42.8 percent of the diet was minnows, 28.5 percent sunfishes, 14.3 percent frogs, and 14.3 percent salamanders, by volume. A study of a Kansas population revealed a similar diet, with 77 percent consisting of fish. Feeding strategies of this water snake are varied. Tongue flicking gathers molecules from the air and from whatever the snake chooses to investigate. The tongue transfers these molecules to a sensory organ in the roof of the mouth (Jacobson's organ, sometimes called the vomeronasal organ), and a message goes from there to the brain. This system is undoubtedly very important in natricines, but a study of captive northern water snakes suggests that they use at least four feeding techniques involving visual cues and that the tongue, in addition to its chemosensory function, is used in another way as well.

The first feeding technique is to simply lunge open-mouthed at the fish, but this often fails. A second strategy is to lie motionless at the bottom of the pond or stream until a fish swims within two centimeters (less than an inch) of the snake's mouth; the fish is then easily captured. Occasionally the snake uses a "fishing" technique, which succeeds more often than not—the snake goes after a fish, thrashing its head from side to side until it strikes the prey. The fourth, most sophisticated technique has been termed "fly-casting." Flattening its body, the snake floats on the surface, flicking its tongue so that the tip barely breaks the water's surface, enticing the unwary fish close enough to grab. Lingual luring, as this technique is known, seems to be used exclusively by natricines.

The young of the northern water snake are born in August and early September; most litters number between 16 and 32. The snakes mature in about 21 to 24 months, but most females do not reproduce until their third year.

Chicago-Area Wildlife Series

This article is part of a continuing series on the wildlife of Chicago and the surrounding region. Previous articles have included "Chicago's Parakeets," "Lake Renwick: Unlikely Haven for the Endangered," "The Wooded Island: Chicago's Premier Birding Area," "Spring Wildflowers of the Chicago Area," and "Late Summer and Fall Flowers of the Chicago Region." Articles scheduled to appear in the coming months cover the subjects of spring bird migration, raising moths and butterflies, and a feature on one of our local native prairies.

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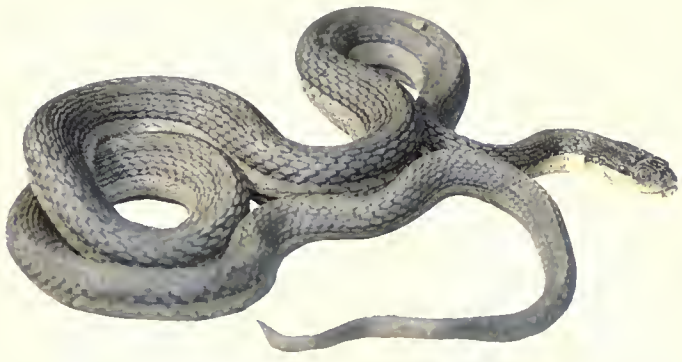
Occasionally, persons in the Chicago area report that they have sighted or perhaps killed a water moccasin (also known as the cottonmouth). The snake in question, however, often turns out to be the northern water snake, a mistake attributable to the latter's aquatic tendencies, dark coloration, stout body, and bad temper when disturbed. Except in zoos, the venomous water moccasin doesn't occur anywhere near Chicago.

Regina: The Crayfish Snakes

Four species of crayfish snakes make up the genus *Regina,* of which two are found in the Chicago region. As a group, these are relatively slender, brown in color, and striped. The common name indicates their food preference. They are more aquatic that *Nerodia,* rarely wandering more than a few yards from the water's edge.

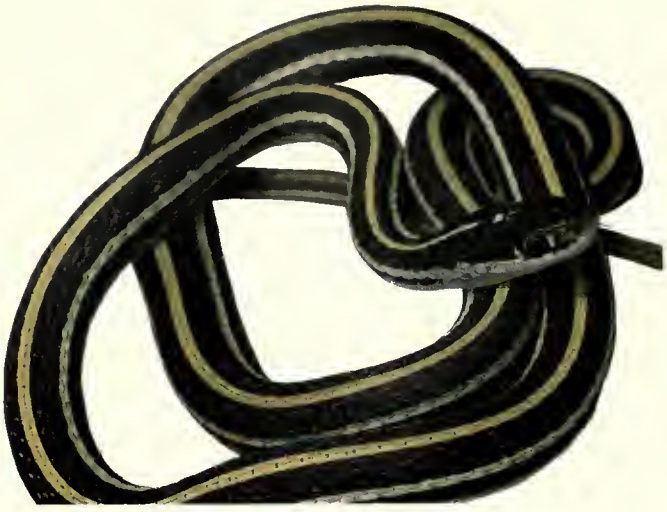
Graham's crayfish snake *(Regina grahamii)* inhabits prairie marshes and ponds from central Texas and southwestern Nebraska to Louisiana and the Chicago area. The most northeastern population of this snake probably occurs in Lake County, Illinois. The **queen snake** *(Regina septemvittata)* has a distribution and habitat that somewhat compliments those of Graham's crayfish snake. Queen snakes inhabit forest streams from southern Quebec to the Florida panhandle and from Illinois eastward to eastern Pennsylvania and central Georgia. An amateur may have trouble telling these two snakes apart, but the queen has a yellow side stripe on the first two scale rows, while Graham's has its stripe on the first three rows. There are also some differences in the belly pattern. Graham's tends to grow larger—18 to 28 inches (44-71cm), while queen snakes are 15 to 24 inches (38-61cm) in length.



Graham's crayfish snake, Regina grahamii. *Note deformed head.*

Both snakes show a decided preference for crayfish that have recently molted. Crayfish with a hard exoskeleton would be difficult for most snakes to subdue and swallow, but just-molted crayfish are soft and vulnerable. On hot summer days, during the early morning hours, it is not uncommon to see queen snakes investigating the shorelines of creeks and quarries, probing the undersides of rocks for the distinctive odor of molted crayfish. Laboratory studies of inexperienced, newborn queen snakes and Graham's crayfish snakes have shown that even from birth they are able to discriminate between the odor of molted and nonmolted crayfish. But it seems improbable that these newborn could find enough small, newly molted crayfish to avoid starvation. More than likely, they supplement this diet with dragonfly and damselfly nymphs.

Queen snake, Regina septemvittata



Western ribbon snake, Thamnophis proximus proximus

Graham's differs from the queen in its daily activity pattern. Queen snakes are decidedly diurnal, spending the night under rocks or in bushes or trees along the shoreline, while Graham's crayfish snakes are nocturnal in the summer, shifting to daytime activity in the fall and spring. This may be an artifact of the habitat difference. Prairies are open habitats where a snake may be easily seen by diurnal predators, while the shrub-lined shores of streams provide good cover, even during the day. Because both snakes are relatively small and cryptically colored, they have been able to survive in and around cities. I have seen fishermen standing next to bushes containing queen snakes, oblivious to the serpent's presence. At a quarry popular with fishermen in the DesPlaines River Valley, I estimated that there was one queen snake for every 30 feet of shoreline. Graham's crayfish snake, however, may not be faring as well in the Chicago area. Many of the local prairie wetlands have been drained for agriculture or suburban development, seriously depleting this snake's habitat.

Thamnophis: Garter Snakes and Ribbon Snakes

Garter snakes and ribbon snakes are probably the best known snakes in America. They comprise the genus *Thamnophis,* numbering about 25 species distributed from southeastern Alaska and Nova Scotia to Costa Rica. It is the largest and most successful genus of New World natricines, some species attaining dense population in and around cities. Three species of this group inhabit Chicagoland.

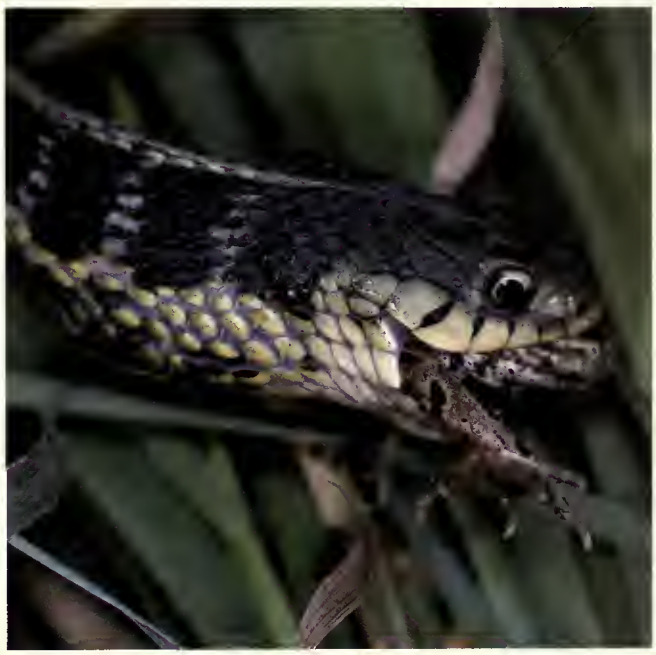
The **western ribbon snake,** *Thamnophis proximus proximus,* is rare in the Chicago area. There are specimens from Cook County and reliable reports from Will County, but its status in northeastern Illinois is a mystery. It is a slender, medium-sized snake, 19 to 48 inches (48-123cm) long, that is black with three light stripes. The green-white side stripes are on the third and fourth scale rows; the dorsal stripe is orange.

Ribbon snakes feed heavily on frogs and tadpoles and are frequently found at the margins of ponds and streams. In Texas a ribbon snake was seen attempting to flush cricket frogs from cover by thrusting its head into clumps of grass.

The young are probably born in late July or in August; the litter size ranges from 4 to 27, the average being about 12.

Eastern plains garter snake, Thamnophis radix radix

Eastern garter snake, Thamnophis sirtalis sirtalis



The **eastern garter snake,** *Thamnophis sirtalis sirtalis,* and the **eastern plains garter snake,** *Thamnophis radix radix,* are extermely common in northeastern Illinois, including densely populated areas. In some localities the two species live together, although the eastern garter snake prefers forest while the eastern plains garter snake prefers prairie. Both feed on a variety of animals, with their diets undoubtedly overlapping; but *sirtalis* prefers aquatic prey such as frogs and leeches while *radix* depends more on terrestrial prey, especially earthworms. One study suggests that *radix* is also a major predator of nestling field sparrows.

Sirtalis has the side stripe on the second and third scale rows, while in *radix* the side stripe is on the third and fourth rows. Another difference is behavior when disturbed: *sirtalis* strikes repeatedly as it tries to escape; *radix* usually does not strike, but thrashes back and forth while releasing a foul-smelling anal musk.

Upon emergence from hibernation in March or April, male garter snakes await the female outside the den. Females exit the den emitting a male-attracting pheromone from a network of capillaries in the back. The pheromone is probably vitellogenin, a substance which is converted into egg yolk. Males detect the pheromone with the tongue and transport it to the Jacobson's organ. The pheromone is species specific; thus, there is little chance of interbreeding between species living together. The male, or males, trail the female and courtship follows. Courting consists of the male rubbing his chin up and down the female's back and aligning his urogenital opening with hers. During copulation the male supplies the female with sperm and a material made in the renal sex segment of his kidney. This material coagulates into a plug that mechanically prevents other males from mating with the female; it also contains a pheromone that makes the female unattractive to other males. In May or early June the female produces the eggs. In June the eggs are fertilized with the sperm that the female has stored since spring. At about this same time, the male is producing sperm he will need for the following spring. In the Chicago area most young are born in early August. This pattern of reproduction is very unusual in vertebrates, but may be widespread in natricines.

Northern redbelly snake, Storeria occipitomaculata occipitomaculata

Litter size in garter snakes is much larger than in most other snakes. *Sirtalis* litters range from 7 to 103 individuals, and averages vary with age, older females producing larger litters; in *radix*, litters range from 5 to 92, with the average near 30.

Storeria: The Brown Snake and The Redbelly Snake

Two species of *Storeria* occur in the Chicago area. They are the smallest of New World natricines, rarely exceeding 20 inches (52cm). They have 15 to 17 rows of keeled, dorsal scales and are usually dull brown or red. The **midland brown snake,** *Storeria dekayi wrightorum,* and the **northern redbelly snake,** *Storeria occipitomaculata occipitomaculata,* are easily distinguished from one another. The brown snake has an indistinct light mid-dorsal stripe bordered by two rows of spots that have fused into crossbands, while the redbelly has three spots on the nape of the neck, two dark stripes bordering the light mid-dorsal stripe, and a bright red belly.

The midland brown snake, also called Dekay's snake, occurs widely in the Chicago area — in forest, grassland, marsh, and human-modified environments. Piles of roofing shingles, boards, and other man-made materials seem to create favorable habitats and man may have actually increased the brown snake's population

Midland brown snake, Storeria dekayi wrightorum

density by discarding these materials in vacant city lots and suburban areas. Captive snakes readily accept earthworms and slugs, but turn down insects, frogs, and fish.

Mating in this species has been reported to occur before and after hibernation. In the Chicago area most young are born from late July to early August. Litter sizes range from 3 to 27, but most often are 11 to 18. The newborn are dark in color, with distinctive light-colored collars.

The northern redbelly snake is not found around Chicago as often as the brown snake, but it is locally abundant. The redbelly is often considered a forest species, but it also occurs in more open habitats such as pastures and weedy fields. Hibernation aggregations have been found in ant hills. In Manitoba, 101 redbelly snakes were found in a single ant hill, together with 8 eastern plains garter snakes and 148 smooth green snakes. Like the brown snake, the northern redbelly prefers slugs and earthworms.

Young redbelly snakes are born in August and September. Litter sizes range from 2 to 21, with the average probably about 10.

Brown snakes and redbelly snakes fall prey to a suit of predators because of their small size. The black widow spider has been reported to feed on brown snakes, and large wolf spiders are certainly capable of overpowering one of these snakes. Lizards, snakes, birds, and mammals also prey upon *Storeria,* but they have evolved some defense behaviors. When disturbed, *Storeria* flare their labial scales (bordering the mouth) to intimidate the predator. If disturbance continues, the snake may writhe, roll over, and gape the mouth while protruding the tongue; the body then becomes rigid. When seized by a predator (or human hand) natricine snakes customarily release musk from two glands on either side of the anal opening. The pungent material is smeared over the snake's body and onto the predator by the snake's twisting.

Clonophis: Kirtland's Snake

Kirtland's snake, *Clonophis kirtlandi,* is an enigma among North American snakes. Rarely encountered, it is represented by few specimens in museums, despite the fact that its distribution includes large midwestern cities. Kirtland's snake rarely exceeds 24 inches (62cm) in length. It has 17 to 19 rows of heavily keeled scales. On the back are four rows of alternating blotches that number 47 to 60, the belly is pink to brick red. The habitat is wet meadows, sometimes wet wooded areas. It is often found in newly developed areas, but specimens may be found years apart at one location, all of this suggesting that Kirtland's snake spends its life underground.

Kirtland's snake, Clonophis kirtlandi

The snake has been observed mating in early May. The young have been born from late July to September in litters ranging from 4 to 22, with an average of about 10. Kirtland's snake was first described by Robert Kennicott in 1856 from specimens he collected near his home in West Northfield (now Glenview), Illinois. FM

Suggested Readings

R. Conant: *A Field Guide to Reptiles and Amphibians of Eastern and Central North America,* 429 pp., 1975, Houghton Mifflin.

C. Pope: *Amphibians and Reptiles of the Chicago Area,* 275 pp., 1944, Chicago Museum of Natural History (Field Museum).

P. Smith: *The Amphibians and Reptiles of Illinois,* 298 pp., 1961, State of Illinois, Dept. of Registration and Education, Natural History Survey Division.

Featherwing Beetles And the Remarkable Discoveries Of Henry Dybas

Henry Dybas (1915-81) belonged to that select group of curators whose entire professional life was given to Field Museum. He is perhaps best known for his studies on periodical cicadas (a.k.a. "17-year locusts"). His most important work, however, may well have been on the featherwing beetles, the Ptiliidae family; Dybas was, in fact, the world's leading authority on this extraordinary group.

The following essay by Douglas J. Preston, which deals largely with Dybas and his work on the featherwings, is excerpted from the recently published Dinosaurs in the Attic: An Excursion into the American Museum of Natural History,* *in which it is entitled "The History."*—Ed.

As I write this, I am in New York City, sitting in a deck chair on the roof of a building physically larger than the Empire State Building. It is sunset, Central Park stretches before me, a cold expanse of leafless trees, winding paths, and dark ponds; just the tips of the bare branches catch the autumn light. Beyond the park is a row of buildings along Fifth Avenue, their windows flashing gold, reflecting the setting sun. To my left I can see West 81st Street, with its row of elegant old apartment buildings, and behind me stretches a patchwork of Upper West Side rooftops. Beyond the rooftops, straight down 79th Street, lies the Hudson River, heaving slowly along like the gray back of some ancient, sluggish reptile.

I am on the roof of the largest private museum in the world—the American Museum of Natural History. Below me lies a fantastic complex of intersecting rooflines, greenhouses, Gothic arches, and towers festooned with granite eagles and copper globes. Far below are hidden courtyards, tiny parking lots, dumpsters, and low roofs. I can see people working behind hundreds of windows grayed with Manhattan soot: hunched over desks, typing on computer terminals, or fussing with animals in aquaria.

Beneath me, somewhere in this vast maze of buildings—the largest repository of scientific collections in the world—is a beetle. This beetle is no bigger than a grain of sand; to the naked eye it is merely a brown dot, the size of the period at the end of this sentence. Sandwiched between glass on a slide, it can be identified only with the aid of a microscope.

I have chosen this fellow—perversely, you might think—as the starting point for our exploration of this gigantic and unclassifiable storehouse of nature. I have chosen it because it is the meanest, tiniest, and ugliest specimen I could find in the Museum. Indeed, the beetle seems to lack any redeeming quality whatsoever; aside from being small and insignificant, it is also boring.

This creature is a common insect known to science as *Bambara intricata.* It belongs to the family of "featherwing" beetles, so called because they possess long feathery hairs on their wings. These hairs enable them to drift on the wind, much like dandelion seeds. This particular specimen is locked up with moth flakes in a clean white cabinet along with tens of thousands of other insects. Like all the Museum's specimens, it is carefully preserved to last for an eternity—or at least for as long as modern technology can afford.

This species spends its three-week life span buried in the decaying litter of the forest floor, feeding mostly on fungus spores. It is a peaceful insect, neither an annoying pest nor a crop destroyer. Although it is extremely common (literally billions can be found in most continents of the world), its existence is unknown to all humanity save for a dozen or so entomologists; and of these, only two or three have any *real* interest in the bug. As I sit on the roof of this Museum and consider that here, beneath me, are some of the most beautiful, rare, and extravagant creations of nature and man, I wonder what could possibly be important enough about this little beetle to warrant its inclusion in the Museum's collections.

To answer this question, we must look back thirty or so years to the discovery of *Bambara intricata.* This particular bug hails from the Bimini islands, a low, windswept string of cays in the Bahamas, not far from Florida. In 1947 the Museum established a research station on North Bimini (now closed) named the Lerner Marine Laboratory. Before then, the area had seen little scien-

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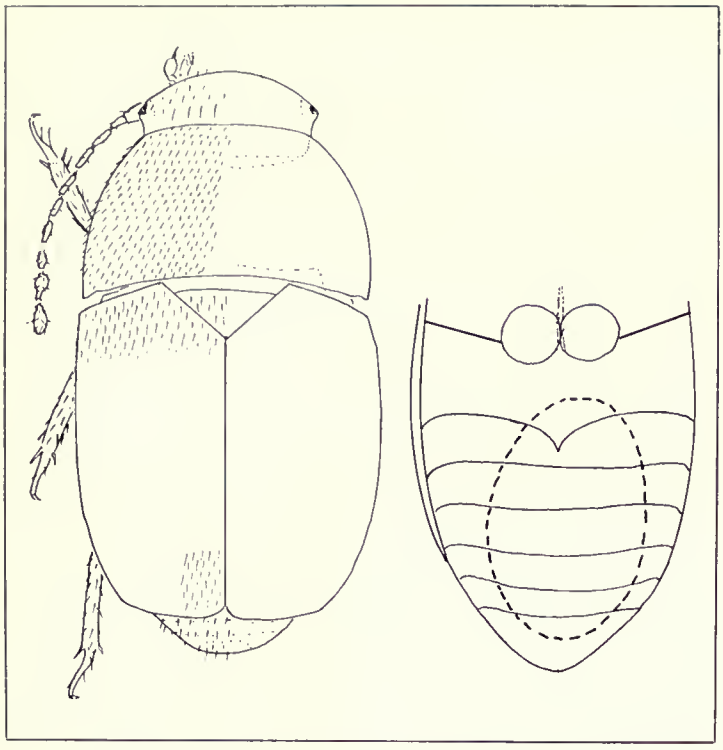
This essay is from Dinosaurs in the Attic: An Excursion into the American Museum of Natural History, *by Douglas J. Preston, copyright © 1986 by Douglas J. Preston, St. Martin's Press, Inc., New York.*



The featherwing beetle Eurygyne intricata, *dorsal view left; partial ventral view right, showing relative size of the single egg (dotted line). The beetle is about 0.6mm in length—less than 1/40 inch. This and seven other species comprised the new genus* Eurygyne, *first described by Dybas in 1966.*

tific exploration, and only two insects had been reported from the island: the mosquito (whose presence was immediately and unpleasantly apparent to the visitor) and a pretty species of butterfly. Thus, one of the first priorities was to do an insect "inventory" of the islands to collect and record the species that lived there. In 1951 a group of Museum entomologists went to Bimini and spent four months luring and trapping as many insects as they could, using nets, funnels, ultraviolet lights, and white sheets. When they were finished they had collected 109,718 insects and 27,839 arachnids, including thousands of featherwing beetles. (To capture featherwings, they used an ingenious contraption called a Berlese funnel, which drives tiny insects out of decaying leaves, bark, and soil.) They caught so many tiny featherwings that the beetles "formed a black cloud" when the collecting vials of alcohol were shaken.

Among these thousands of specimens, the Museum scientists found that six species of featherwing beetle were present on the island. Eventually the vials of alcohol were transferred to the main entomology storage area in New York City, where for fifteen years they rested in a dark cabinet.

In the mid-sixties, someone finally took an interest in the insects. A curator at the Field Museum of Natural History in Chicago, Henry Dybas, borrowed a number of the vials containing the featherwings for a research project on a strange phenomenon known as parthenogenesis—the reproduction of an animal without fertilization by the male. Dybas had evidence that many species of the featherwing beetle exist in all-female populations, reproducing without the aid of males. He wanted to examine a large number of specimens collected at the same time to see if indeed they were all female. In doing so, he developed several startling theories.

Through his examination of featherwing beetles, Dybas was able to illuminate the complex workings of a small corner of the natural world. He wondered, for example, why the beetles were so small. He wanted to know why many species or populations seemed to have done away with males. Finally, he had observed that the featherwing beetles from Bimini had no feather wings, even though the same species on the mainland possessed them. After some thought, Dybas came up with an interesting interlocking theory that explained these three questions.

First, he had reason to believe that the beetles had evolved from a larger into a smaller size, primarily because they needed to be light enough to float on the wind, and thus to occupy a niche in which smallness was an advantage. In becoming small, however, the featherwings could carry fewer and fewer eggs, since the eggs could not be "miniaturized" the way the insect could. Thus, the Bimini beetles lost the ability to carry thousands of eggs and produce many offspring at a single time, as most other insects do. Indeed, they became so small that the female was only able to carry one egg at a time. That single egg became much more biologically precious when it was the only one available—and thus the female had to ensure that it was fertilized and hatched. Unfortunately, this structure made finding a male to fertilize the egg quickly rather important. Indeed, finding a male became such a matter of inconvenience for the female of a species with such limited mobility that the population eventually did away with males entirely. Instead, the egg matures *without* being fertilized, by the process called parthenogensis. And when the males were bypassed in the reproductive process, they eventually died out.

To corroborate his theory, Dybas looked to see if other extremely small insects had developed parthenogensis. Just as he suspected, he found other species that had done away with males.

Next, he addressed the riddle of why 80 percent of

the Bimini beetles lacked the feathery wings that were present on the same mainland species. The obvious answer came to him in a sudden flash. On a low, windswept island such as Bimini, beetles dispersed by air currents stood a great chance of being blown out to sea and certain death. (On the mainland, of course, dispersal would be a favorable adaption, allowing the beetles to spread to new habitats.)

Dybas's research, however, did more than just prove his hypothesis. While researching his theories, Dybas examined one vial of American Museum specimens in detail, all supposedly of the same species. He noticed that a particular internal organ in some of them differed markedly from the same organ in others from the same vial. He realized that one of the groups was a new species, entirely unknown to science.

The science of zoology has established that certain things must be done when a new species is discovered. In the first step, the discoverer must select one organism as the "type" specimen. The type specimen then becomes the physical and legal representative of all of its kind. It will be the actual specimen the scientist uses to describe what the new species looks like, and it is the individual that all others will be compared or contrasted with, and measured against, for the rest of time. Today, most species of animal are represented somewhere by a type specimen, many of which date back several centuries or more.*

Thus, from the hundreds of specimens of the new insect, Dybas selected the most normal, the most *average* individual he could find, and designated it the type. In doing so, he made an utterly insignificant beetle—an almost invisible brown period—a scientifically priceless specimen. Underneath me somewhere is that tiny brown beetle, locked up in its cabinet, resting in perpetuity as the official representive of all of its kind.

The Museum is the guardian of thousands of such seemingly insignificant specimens, but as each bone in the mighty *Tyrannosaurus* is just a piece in the puzzle of the whole, each tiny bug is an indispensable link in the chain of knowledge that exists in the collections of the American Museum. Like the beetle, virtually every Museum specimen is invested with significance and a history. (Indeed, specimens without a history are often thrown out.) I opened this book with *B. intricata* because it is an example, in microcosm, of what the Museum is. Most of the Museum's more exciting specimens don't have the kind of calm, rational history that *B. intricata* possesses. Roy Chapman Andrews fought gun battles with Mongolian bandits to protect *his* dinosaur specimens; Carl Akeley lost his life in the Belgian Congo collecting for the Museum's African Hall; Fitzhugh Green lost his mind while searching for a continent that didn't exist. These stories seem superficially very different from the story of *B. intricata*—but they all are links in the vastly complex history of the American Museum.

*Homo sapiens *was lacking a type specimen until one waggish zoologist proclaimed his body as the type for the human species and issued directions that his body be preserved after death for the edification of future scientists.*

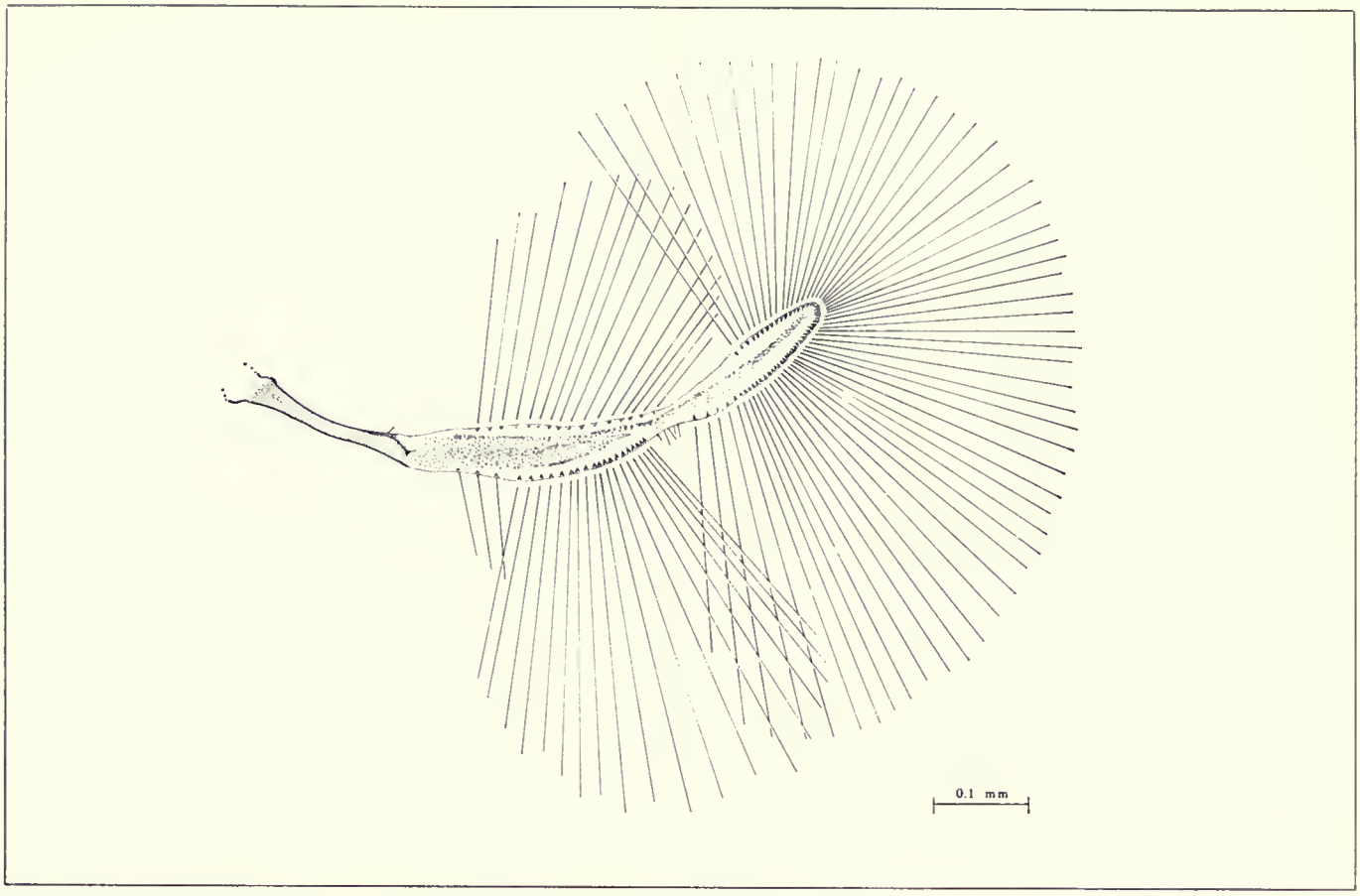
Featherwing Beetles

by Henry S. Dybas

This essay originally appeared in the April 1966 Bulletin, *vol. 37, no. 4. Later that year Dybas published the formal paper "Evidence for Parthenogensis in the Featherwing Beetles, with a Taxonomic Review of a New Genus and Eight New Species (Coleoptera: Ptiliidae)" in* Fieldiana: Zoology *(vol. 51, no. 2)*—Ed.

One of my special research interests is in the smallest known beetles, the featherwing beetles (scientific name: Ptiliidae). The common name derives from the curious structure of the wings.... These beetles are minute; the smallest are only one seventy-fifth of an inch long. This is less than the size of some single-celled Protozoa, yet they have compound eyes, antennae of many segments, complex mouthparts, wings, and all other essential parts of their larger relatives. Almost none are longer than one twenty-fifth of an inch. They are truly remarkable examples of biological miniaturization.

Because featherwing beetles are so small, most biologists never see them in the field, even though they



Wing of the featherwing beetle Eurygyne lutea *(total length of wing 0.9mm). The "conventional" airfoil structure of the wing in larger insects has been replaced in the Ptiliidae with a featherlike structure, better utilizing the lift effect of even slight breezes.*

may be very abundant. The family is world-wide in distribution and occurs in moist places like the leaf litter of the forest floor, tree-holes, under bark, logs, or decaying seaweed on beaches. Each situation will have its own particular kinds of featherwing beetles. Sometimes several hundred can be found in a square foot of forest floor. It seems that they feed chiefly on spores and hyphal threads of molds and other fungi in decaying organic materials. They form a component of a complex, but little understood, web of life that is the biology of our soils. One of the attractions of investigating such little-known creatures is that so much remains to be discovered about them. Some of our commonest species have not been described or named yet, and almost nothing is known of their life-cycles, behavior, or modes of life. Nearly everything one learns about them is completely new.

Recently, I have been reviewing a genus of featherwing beetles that is very abundant in Florida and the adjacent Gulf States, in decaying leaves and other materials on the ground, but that has completely escaped record in the United states. I now know of seven species in Florida, and another from the nearby Bahama Islands, which need to be described and named for the first time. In large part, these new species are the result of intensive and specialized collecting by Dr. Walter Suter, a young biology professor at Carthage College in Kenosha, Wisconsin and by Mr. J. Harrison Steeves, Jr., a prominent architect in Birmingham, Alabama. Mr. Steeves' hobby of collecting and studying beetles must appear remarkably esoteric to his business associates.

The main collecting technique involves the use of the insect funnel. The principle of the funnel is very simple. Moist forest floor or other debris likely to contain insects is placed in a shallow layer on a screen in a large funnel. Heat, usually from an electric lightbulb, is applied from above. As the debris gradually dries or heats up, the tiny insects move down deeper through the debris where, in nature, it would ordinarily be more moist and cool. In the funnel, though, they pass through the screen and fall down the steep slopes and collect in a vial attached to the spout. An astonishing number and variety of tiny insects and mites can be extracted in this way from small amounts of debris. There may be several

thousand in a square foot of forest floor a few inches thick. This simple technique, originally devised by an Italian entomologist named Berlese, made it possible for the first time to sample systematically the microhabitats of an area for tiny insects and related arthropods and to obtain adequate series for study.

Tiny beetles like the featherwings must be prepared as microscope slide mounts for study. This is somewhat more delicate and tedious than mounting insects of ordinary size. But it provides a wealth of information, not only about the structure and relationships of these little animals, but indirectly about their biology. For instance, it soon became evident, in my examination of this genus, that there was never more than one egg in the abdomen of the female, for the simple reason that the egg was relatively huge—fully half the length of the beetle! The explanation for this phenomenon was pointed out for some other kinds of arthropods not too many years ago by the noted biologist Bernard Rensch, who stated that each egg needs to be provided with enough yolk for the embryo to develop and hatch into a self-sufficient larva. Hence there is a size-limit beyond which the egg cannot be reduced in most insects and related forms. Evolution of small size open up many new food sources and living spaces. In the process, however, the number of eggs that can be accommodated and matured in the abdomen must become fewer and fewer until, finally, the irreducible minimum of one egg is reached and a limit to further reduction in size is imposed. Presumably, featherwing beetles are now at the size limits dictated by their mode of development and way of life. No one knows how long a female featherwing beetle can live and reproduce, nor how long it takes a single egg to mature or a larva to develop. Yet it would seem that the total egg output per female must be very low in comparison with that of many other insects. So the abundance of featherwing beetles in some situations becomes something of a problem to explain. There must be some compensatory mechanisms such as increased speed of development, continuous (rather than seasonal) reproduction, and other factors, but at present we know too little about their biology to know what these compensatory mechanisms might be.

Another consequence of small size is its effect on wings and flight. The normal insect wing acts aerodynamically like that of a bird or airplane wing—a flow of air over the surfaces provides lift. In the size range of the featherwing beetles, though, the viscous drag forces of the air are evidently much greater than any possible lift forces, and the wings can no longer function in the same way.

Flight in such microscopic forms has never been directly observed; it would be technically difficult. The long marginal hairs of the featherwing account for most of its expanse. If, as has been suggested, these hairs bend more easily on the upstroke than on the down, the lift forces may exceed the dragforces and the insect may be able to "row" its way through the air. Other very small insects evidently have encountered the same problems, because a similar "featherwing" has been evolved independently in several unrelated groups of insects, most notably in tiny wasps that are parasitic in the eggs of other insects. Flight of featherwinged insects would seem possible only in still air over short distances. The featherwing is probably an adaptation for floating in the air like a dandelion seed and for dispersing over distances by means of air currents. Such passive dispersal implies wastage, because many featherwing beetles must be wafted to unfavorable places and lost. This adds to the problem of how featherwing beetles manage to get along with such an apparently low egg production.

Another curious feature that emerged in the course of studying these tiny Florida featherwings was the complete absence of males in at least five of the new species. This can not be attributed to accidents of sampling because in one species there were over 9,000 specimens collected in more than 30 countries, over a span of eight months of the year, and all were females. I was forced to conclude that these species were able to reproduce without males—a phenomenon that is well-known, though spotty, in the animal kingdom and which is termed *parthenogensis.*

Why is there such an unusually high incidence of parthenogensis in these tiny animals? In the long run, parthenogensis is considered an evolutionary dead end because it precludes exchange and recombination of hereditary materials between different individuals through mating and this inhibits adaptation to changing circumstances. In the short run, though, there may be several advantages. One that is particularly relevant is that all the eggs produce reproductive females; none are wasted on males. In effect parthenogensis doubles the reproductive potential of a population in one jump—an enormous advantage to insects that mature one egg at a time. So I arrive at a final thesis. Obscure as they are, there may be a real relevance is studying such tiny insects. They are important in their own right because of their activities and because of their complex relations with other forms of life in our fields and forests. And because they are faced with extreme problems as a result of their small size, their study can provide insights into problems of general biological interest.

Henry Dybas

A Eulogy

by Rupert L. Wenzel
Curator Emeritus of Insects

This eulogy was delivered by Dr. Wenzel at Bond Memorial Chapel, the University of Chicago, on October 9, 1981, at memorial services for Dybas. The two men had been colleagues in the Museum's Division of Insects for over four decades. With some emendations, it is reproduced here largely for the additional perspective it provides in viewing Dybas's valuable contributions to parthenogensis research. It is also a warm, sensitive portrait of Henry Dybas, the man.—Ed.

Henry Dybas in Panama, 1959, collecting featherwing beetles from mushrooms. 88957

When word of Henry's death came to us in Maine, it was not entirely unexpected. While there was a sudden sense of emptiness and sadness, there was also the realization that just as the lives of his family, and those close to him, would in some ways be irrevocably changed by his going, our lives had been affected, in many ways irrevocably, too, by having known him.

On our way home, I constantly reflected on the events which had brought us together nearly half a century ago and which inextricably interwove our lives—through college, courtship, marriage and families, military service, our professional careers, and retirement—a long personal and professional relationship, which like many marriages, had its rocky periods, but which matured and endured.

Henry was born in Chicago July 10, 1915. He attended Chicago public schools and graduated from Lindblom High School in 1933. He received his B.S. degree from the old Central YMCA College, Chicago in 1940, and an honorary Doctor of Science from Tri-State University, Angola, Indiana in 1980.

His interest in natural history developed early. In high school he was especially influenced by two teachers, Messrs. Johnston and Croft. During this time a close friend, Bill Neitzel, an engaging and brilliant young man, introduced Henry to the Division of Entomology at Field Museum, which from then on played a major influence in shaping his life and career. He was much influenced by Curator William Gerhard, Assistant Curator Emil Liljblad, A. B. Wolcott of Harris Extension, and Karl P. Schmidt, chief curator of Zoology.

Henry and I met as a consequence of a political act. In 1933, some of the faculty of Crane Junior College, including Lillian Hirstein, a labor spokesperson and one-time legislator, had the "nerve" to organize a Chicago teachers protest parade because they had not been paid (except in scrip) for a couple of years. To show his displeasure and to eliminate and/or disperse the faculty, Mayor Cermak closed Crane, citing "economic" rea-

sons. (A year later, after getting rid of the dissidents, he opened three new city junior colleges.)

In the fall of 1933, the Federal Civil Works Educational Service opened a temporary college at the University of Chicago downtown "campus." This was created in order to take care of students who had been "left in the cold" by the closing of Crane, and to employ unemployed college professors. As a displaced Crane student, I enrolled.

While talking to another student in the hallway between classes one day, I was trying to describe the appearance of something and compared its shape to that of the antenna of a cecropia moth. A young man next to us turned around and said "What do you know about cecropia moths?" In this way, Hank and I were brought together.

Shortly thereafter, Henry introduced me to the Division of Entomology, as it was then called, at Field Museum. In June, 1934, the CWES college was closed. Henry enrolled in one of the new junior colleges (Wilson), and I began a year at the Museum as a volunteer in the Division of Insects. At Wilson Junior College, Henry's interest in insects was furthered by Dr. Frank Schuett.

Following his graduation from Wilson Junior College, Henry got a job in the Museum Division of Entomology on the Works Project Administration Program and was married. With his wife's encouragement, he continued his education at the Central YMCA College as a student, teaching assistant, and later as a close personal friend and colleague of Dr. Charles Seevers.

Following graduation, he worked temporarily at the Museum as an assistant in the Division of Entomology, and then, briefly, as a payroll clerk at Crane & Company, before again returning to the Museum as a temporary employee. Following military service in World War II, he was appointed to the regular staff, and continued his education part time at the University of Chicago. Unfortunately, circumstances did not permit him to complete his doctorate, but the training and guidance under Prof. Alfred Emerson and Dr. Thomas Park were invaluable.

In 1980, Henry received an honorary D.Sc. from Tri-State University, Angola, Indiana, in recognition of his research contributions. A symposium dealing chiefly with periodical cicadas was arranged in his honor.

Fieldwork

One of Henry's greatest loves was fieldwork. He did field collecting in Panama, Mexico, Colombia, the United States, and Micronesia. I remember how jealous I was, when he and Charles Seevers arranged to go on their first foreign field collecting trip to Colombia, while I had to stay behind to continue my studies.

Henry was an outstanding field man, one of the best insect collectors in the world. During World War II he was fortunate to be assigned to a malaria survey unit that was sent to the Mariannas to cope with an outbreak of dengue fever. By the time they arrived, the epidemic had subsided and there was little for the unit to do. Henry spent a great deal of time collecting. The collections he made in the Mariannas and Palaus during this time, and again following the war under the auspices of the Pacific Science Board, provided the impetus for the survey and the resulting volumes of the publication *Insects of Micronesia.* An estimate of Henry's expertise as a collector may be gained from the fact that even though a number of other entomologists collected in Micronesia as participants in the survey, Henry's collections alone contained about 40 percent of all the species now known from these islands, and between 20 and 24 percent are known only from his collections.

His greatest success as a field collector was due to his almost innate appreciation of ecology, especially as regards niche specialization and diversity. He was a born ecologist.

His background of insect ecology stood him in especially good stead when, with Dr. Monte Lloyd, the late Dwight David, and others, he undertook the now classic studies on the population ecology and evolution of periodical cicadas — perhaps his greatest scientific contributions. They are models of field observation and analysis.

Henry transmitted his love of nature and biology to his daughters. One of them, Dr. Linda Dybas, received a doctorate from the University of Ulm, Germany, and is an assistant professor of biology at Knox College, while his daughter Marcia earned a degree in environmental biology at the University of Santa Cruz.

Henry was a member of and supported a number of ecological and conservation related groups. He was an early critic of some of the major pesticide programs and was an influence in eliminating the use of DDT for mosquito control in his own Mosquito Abatement District and in Illinois.

Research

Henry's research interests developed through his fieldwork. As noted before, his work on periodical cicadas from 1956 on, resulted in publications that were models in population biology and ecology.

He was, however, primarily interested in the sys-

Rupert L. Wenzel (left) and Henry Dybas in their lab in the Field Museum, 1947.

tematics, biology, and evolution of ptiliid beetles. Henry believed that systematics required the integration of all sources of information—ecological, physiological, and anatomical—and his research on these beetles reflected this.

He became especially interested in problems concerned with evolution of small size. A recent and most stimulating paper dealt with parthenogensis in these beetles.

One of his great satisfactions was his work with his daughter Linda, with whom he recently co-authored a fascinating paper on the sperm structure of a group of ptiliid beetles and its relation to their taxonomy.

Teaching

Henry enjoyed teaching and working with students. He held adjunct faculty appointments at the University of Chicago and Northwestern University, He participated in teaching courses for the University of Chicago, taught in the evening division at Northwestern, was a visiting summer professor, teaching ecology, at Knox College and also at Southern Illinois University, and gave numerous invited seminars at various institutions.

Professional Studies

Henry was a member of a number of professional societies. He was a founding member of the Society for the Study of Evolution and a fellow of the American Association for the Advancement of Science. He served as chairman of Section A of the Entomological Society of America, our largest national professional entomological organization, and served on its governing board for two years.

Museum

While the Museum played a profound role in shaping his life, Henry also played an important role in helping shape the Museum. He was an invaluable partner in

planning and molding the revitalization and growth of the Division of Insects. I couldn't tell you how many countless hours we spent over the years discussing goals and means of achieving them.

Since its inception, he served on the Schmidt Fund Committee, which made monetary awards to students and professionals who wish to study at the Museum.

He helped plan and prepare various of the insect exhibits presently on display, as well as a number of temporary exhibits, including what was probably one of the most successful in the history of the Museum, the 1973 multi-media exhibit on the periodical cicadas. He was also instrumental, with Rainer Zangerl, in initiating the *Man In His Environment* exhibit. One of his greatest disappointments was our inability to move ahead on the execution of a Hall of Insects, which we had planned in considerable detail.

Henry played an active role in departmental and museum-wide affairs. He was an effective and constructive critic.

He prepared the first successful grant proposal to the National Science Foundation for support of a Field Museum collection. This has been renewed twice since.

Henry as a Person

Henry was a modest and quiet man. He abhorred blowing his own horn. He was friendly, open, very social. He was also strong-minded and at times could be disconcertingly frank. He enjoyed conversation with friends and colleagues, whether it be intellectual exchange or tidbits of information about colleagues at the Museum.

He was intellectually alert, always interested in new findings and developments, even to the end. He both stimulated and was stimulated by his colleagues and met with them regularly at lunchtime sessions.

He was concerned about people and always willing to lend an ear to their problems, especially of the young. He served as a sounding board for ideas, and he was a valuable resource for advice and criticism—scientific, professional, and personal.

He carried on an extensive correspondence and maintained lasting friendships with many colleagues, here and abroad.

Wide Interests

Music was a crucial need in Henry's life. He loved music with a passion, a love he probably inherited from his father, who still composes songs.* He shared this love with his wife, Milada, who as a precocious young musician, was a gifted concert pianist and later, teacher. Millie tells how, while courting, Henry would lie on a couch for hours listening to her practice. Henry studied the French horn under Philip Farkas, former principal horn player with the Chicago Symphony Orchestra, and was a member of his high school and college symphony orchestras. He and Mil belonged to a "record club" of music devotees, who, for many years, met socially to listen to good music. They formed lasting friendships through this group.

He had a lively interest in politics. I well remember the sessions we had meeting at homes with friends on Saturday nights, drinking a few beers, sitting around telling jokes, discussing everything from music to politics, dissecting the problems of the world and solving them.

Henry helped organize the South Cook County Mosquito Abatement District. He was a member of its board of trustees for 22 years, serving as secretary, vice president, and president. He did much to help formulate its goals and policies.

Henry played football in college.

He also served as a Boy Scout counselor in South Cook County.

Health

Henry had been seriously ill for some time. A number of years ago, he had major surgery for bone cancer, an experience that was terribly traumatic for him physically and emotionally. Later, he experienced chronic pain which so incapacitated him that at one point we thought he might never return to the Museum. But he made it. He would be up on his feet for limited periods, then lie on his "pad," to read, take care of his correspondence, and write his manuscripts.

A couple of years ago he became ill from Waldenstrom's anemia, possibly as a result of X-ray treatments given earlier at the time of his bone cancer. He met this crisis with great courage. One of the, to me, astonishing things, for a man who had a dread of illness and found it difficult to discuss illness or death, was the remarkable way in which he was reconciled to his condition and made peace with himself.

During his final illness, we had great hopes that he would experience a remission that would permit him to complete a number unfinished projects. This was not to be. Through all of this his life was made endurable through the love and support of his family, especially of his wife Milada. FM

Deceased 1985

FIELD MUSEUM TOURS

Explore the primeval splendor of the Canadian Northwest.

Field Museum Tours invites you on an expedition to the stunning Northwest, including Seattle, Prince Rupert, Queen Charlotte Islands, Fitzhugh Sound, Alert Bay, Princess Louisa Inlet and Victoria aboard the Society Explorer.

PROJECT CANADIAN FJORDS & INSIDE PASSAGE

Departing:
August 16, 9 Days

August 16, Seattle. Arrive and transfer to our deluxe hotel. After a reception at the University of Washington's Burke Museum, enjoy dinner and Seattle's nightlife.

August 17, Prince Rupert. Depart Seattle on morning flight to Prince Rupert. After a ferry crossing to Prince Rupert, board the *Society Explorer* for an evening departure. Enjoy the captain's welcome dinner as we set sail at sunset for the Queen Charlotte Islands.

August 18-19, Queen Charlotte Islands. Journeying south, we arrive at the unspoiled home of the Haida Indian Nation where braves erected countless totem poles, each carved to tell its special story. Today these moss-encrusted monuments testify to the centuries-old Haida way of life. We explore these islands with their brooding forests harboring ancient villages. Bald eagles, seabirds, Stellar sea lions and whales provide opportunities for rewarding walks and beach hikes.

Society Explorer

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

August 20, Fitzhugh Sound. This morning we sail into the upper Fraser Reach and Grenville Channel for a day of exploration among the magnificent wave-sculpted canyons and craggy inlets of the Canadian fjords. At Kwakshua Inlet, an area rich in abalone and other Northwest sea life, hikers will enjoy exploring the coastal woods of 100-foot stands of red cedar, Sitka spruce, western hemlock and Douglas fir. Our ship sails south into a region of towering cliffs, and rushing waterfalls.

August 21, Alert Bay. Following an afternoon cruising the Inside Passage, our ship puts in at Alert Bay, ancestral island home of the Nimpkish, largest tribe of the powerful Kwakiutl Indian Nation. According to anthropologist Franz Boas, the word Kwakiutl means Smokes of the World, which alludes to their ability to attract huge throngs of people to their firelit potlatches and ceremonials. We'll visit the U'mista Cultural Center/Alert Bay Museum. Here we see fine examples of the distinctive ceremonial masks, utensils and bentwood boxes—important elements of the rich Kwakiutl lifestyle—and have the opportunity to purchase native handicrafts, jewelry and artwork.

After lunch, we'll move into the Queen Charlotte Strait, the summer gathering place for close to 300 killer whales, uncontested top predators of Canada's northern waters. Roaming the protected waters of the Inside Passage in clearly defined pods, males, females and young cooperate in hunting their prey. Killer whales have no natural enemies other than man.

August 22, Princess Louisa Inlet. Passengers experience a realm of snowmelt cascades and 6,000-foot mountains ringing this spectacular horseshoe-shaped fjord. Overhead, bald eagles soar, slicing through the coastal mists with their six-foot wing-spans. At the tumultuous Chatterbox Falls, we'll go ashore to walk alpine meadows full of lupine, dwarf dogwood and chocolate lily. Others may follow the trail which ends at the long abandoned Trapper's Cabin, built in the shadow of scenic Mt. Albert.

August 23, Victoria. Midday arrival in Victoria, British Columbia. Victoria's distinct English flavor is reflected in the copper-domed Parliament buildings heralding our entry into the harbor. This afternoon we tour the Provincial Museum with its comprehensive collection of coastal Indian art and artifacts and its life-sized replica of a 19th-century frontier town. Stroll the cobbled streets, perhaps stopping to sip tea at the ivy-covered Empress Hotel. The captain hosts a farewell dinner tonight as we sail for Seattle.

August 24, Seattle. Morning arrival and connection with homeward flights.

This tour will be enhanced by a team of expert lecturers in the region's natural history, native cultures, and wildlife, including *Dr. Scott M. Lanyon,* Field Museum's assistant curator and head of the Division of Birds.

CRUISE COST PER PERSON

Explorer	$1,790	Boat Deluxe	$2,690
Explorer Deluxe	$1,950	Suite	$3,190
Yacht	$2,320	Owner's Suite	$3,590
Yacht Deluxe	$2,490	Airfare (not incl. in rates)	$190

Rates are per person, double occupancy, and include group transfers, cruise accommodations, all meals including a welcome cocktail and dinner party and farewell dinner, lectures by accompanying or visiting speakers, and all off-ship excursions. Amenities include travel bag, backpack, documentation wallet, comprehensive guide book and daily log. Single cabins are available at 1.5 times the above rates, except single suites which are 1.9 times the above rates. Airfare is approximate and subject to change.

Deposit $500.000 per person

People's Republic of China

18 Days

September 16 – October 3, 1987

Customized Tour exclusively for Field Museum
Organized and accompanied by
Katharine Lee

Stanton Cook, courtesy *Chicago Tribune*

The itinerary for this exceptionally well conceived tour covers the highlights of this fascinating country. We depart Chicago via Japan Air Lines. Our first stop will be Tokyo, where we will enjoy a city tour. Chinese cities to be visited include Shanghai, Wuxi, Beijing, Luoyang, Xi'an, and Guilin, plus a boat ride on the Li River. We'll exit through Hong Kong, a city full of Oriental treasures and cultural heritage. This is a "not to be missed" opportunity.

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Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

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FIELD MUSEUM OF NATURAL HISTORY BULLETIN

April 1987

Music and Dance in Papua New Guinea

Opens April 29

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COVER

THE SNOWDROP *(Galanthus nivalis)*, a bulbous, introduced plant of the amaryllis family, is among the first flowers, cultivated or otherwise, to let us know that spring is almost upon us. These were photographed in Chicago in mid-February, but some continue to be seen in April.

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Events

Thomas Waller

Mystic Paper Beasts

Saturday and Sunday, April 4 and 5, 2:00 pm
Stanley Field Hall

MYSTIC PAPER BEASTS with performance artists and masters of disguise Melisande and Daniel Potter, create astonishing masks and costumes that redesign the human body and bring the inanimate to life. Ingenious use of paper and fabric, with inventive sounds and mime, miraculously transform the two into a violin and sheet of music, a cow, a bear, or one enormous face. The Beasts present humor ranging from everyday life to Greek mythology, while transformed in completely unexpected ways. Enjoy with us their comic adaptation of ***Rappaccini's Daughter*** by Nathaniel Hawthorne. This program is free with Museum admission and tickets are not required.

Continued →

Events

April Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the *Weekend Programs* sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

April

11 2:00pm *"Spring Wildflowers"* (slide lecture). Slide lecture featuring the wildflowers found in Chicago's woods, meadows, and prairies.

18 2:00pm *"Spring Wildflowers"* (slide lecture). Slide lecture featuring the wildflowers found in Chicago's woods, meadows, and prairies.

25 11:30am *"Ancient Egypt"* (tour). Explore the traditions of ancient Egypt from everyday life to myths and mummies.

26 2:00pm *"Malvina Hoffman: Portraits in Bronze"* (slide lecture). Examine the life and works of Malvina Hoffman, concentrating on the "Portraits of Mankind" collection commissioned by Field Museum.

Adult Courses

Learn techniques of Chinese ceramic glazing, delve into life in ancient Egypt, or begin to master the graceful movements of Tai Chi Chuan. Adult programs continue in April and May with exciting new six-week, three-week, and one-day classes. Course fees range from $30 to $80. Consult the April/May Adult Course program brochure for details to register.

Special Course

"Birds in Music and Musical Aspects of Bird Song"
Thursday, 7:00-9:00 pm; April 9; $7 for members, $10 for nonmembers.
The aesthetic qualities of bird songs have inspired composers of both classical and contemporary music. Dr. James Gibson, assistant professor of music and amateur ornithologist, explores the fascinating relationship between the lyrical notes of bird songs and the music that reflects them.

Featured Course

"Crisis on the Lakefront"
Tuesdays, 7:00-9:00 pm; April 28-June 2; $50 for members, $60 for nonmembers.
Rising lake levels have brought a flurry of public debate over how to protect the lakefront from further erosion. This six-part lecture series brings together environmentalists, geologists, and other specialists to discuss causes of this natural phenomenon and ways Chicago and other lakefront communities can work together to cope with the crisis.

Events

Edward E. Ayer Lecture Series

The first four Thursdays in April mark the continuation of the free Edward E. Ayer Lecture Series. The narrated slide programs begin at 1:30 pm and meet in Lecture Hall I. Included are presentations on India, the Western National Parks of the United States, wildflowers, and Mexico.

April 2 *"Spring Wildflowers"*

Peter Dring, Naturalist, Cook County Forest Preserve.

Welcome the coming of Spring with a visual walk through Illinois' woodlands, prairies, and wetlands admiring and identifying a wide variety of spring wildflowers. Learn more about their natural habitats, folk history, their medicinal uses, and when they bloom in the area.

April 9 *"Western National Parks"*

Paul Sipiera, Associate Professor, Department of Physical Sciences, Harper College.

Enjoy the majestic landscapes of America's Western National Parks while discovering their fascinating geological history. Why did the Grand Canyon form? How did Yosemite achieve its breathtaking beauty? Answer these questions and more while you tour our Western geologic wonders.

April 16 *"Traveling in India"*

Vincent Michael, Director of Chicago Programs, Landmark Preservation Council of Illinois.

The art and architecture found in modern India reveals its enduring rich cultural and religious heritage. Visit ancient Buddhist shrines, Hindu temples of the North, and the famous Taj Mahal at Agra, in this tour of India's religious temples and art.

April 23 *"A Modern Look at Ancient Mexico"*

Don McVicker, Professor, Department of Sociology and Anthropology, North Central College

A visitor to modern Mexico can still experience the glory of cultures past. In southern Mexico, evidence of the high Mayan civilization remains apparent. See the monuments built by these remarkable people and the sun-baked countryside that was their home.

World Music Program

Music communicates in many ways. It is something that can be shared by all of us, whether or not we have common lifestyles, beliefs, or even languages. April's World Music Programs feature the brilliant percussion of Famoudou Don Moye, Ravanna Bey, and Ansari Abdul Sabur.

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The World Music Program is supported by Kenneth and Harle Montgomery in honor of E. Leland Webber, president emeritus of Field Museum.

THE ANCIENT VILLAGES OF SOUTHERN PERU

by Charles Stanish

According to historical legends recorded by Spanish chroniclers in the 16th century, the armies of the Inca Empire entered the vast Titicaca Basin in the latter half of the 15th century. For more than 2,500 years prior to the Inca conquest, the cultures which developed along the shores of Lake Titicaca and its surrounding countryside had dominated the entire South Central Andes, an area as large as modern California and encompassing parts of the four modern nations of Peru, Bolivia, Chile, and Argentina. The incorporation of the Titicaca Basin by the Inca Empire marked a turning point in Andean history: for the first time in almost three millennia of human occupation, a foreign polity conquered this rich and populous region.

During their expansion into the South Central Andes, the Incas confronted two major polities which together controlled the western half of the entire Titicaca Basin. These two groups, known as the Lupaqa and Colla, were bitter enemies. According to the Spanish chroniclers, the Inca took advantage of this rivalry and allied themselves with the Lupaqa, essentially squeezing their common enemy on the northern and southern flanks. Together, these two allies crushed the Colla and surrounding populations. The Inca Empire then took control of the Titicaca Basin, employing a form of "indirect rule," incorporating the Lupaqa into the imperial bureaucracy, and permanently reducing the Colla and neighboring polities to the status of subject ethnic groups in the huge imperial system.

Prior to the emergence of the Lupaqa and Colla in the 12th or the 13th century A.D., the Titicaca Basin was home to a number of distinctive and dynamic polities throughout its history. One of the most important and impressive of these was Tiwanaku, located in the valley of the same name in modern Bolivia.

A century or two after the birth of Christ, the settlement at Tiwanaku began a process of regional power consolidation that culminated in the development of the first and only autochthonous empire (*i.e.*, ruled by natives of the region) in the South Central Andes. By approximately A.D. 400, the entire Titicaca Basin and surrounding areas were under the geo-political control of the Tiwanaku state. The Classic and Expansive Periods of Tiwanaku (A.D. 375-1100) were times of intense growth of the economic base and political power of the state characterized by the initiation of massive agricultural projects near the lake, the founding of major political centers away from the capital itself, and the expansion of economic and political networks throughout the South Central Andes. (See "Tiwanaku: Portrait of an Andean Civilization," by Alan L. Kolata, *Field Museum Bulletin*, September 1982.)

This vast, 1,000-year-old empire had virtually collapsed by A.D. 1100, and perhaps earlier. The cause (or causes) of the collapse of the Tiwanaku Empire remains one of the great mysteries in South Central Andean archaeology. What is clear, however, is that the fall of Tiwanaku ushered in a period of cultural fragmentation and the emergence (or reemergence) of dozens of local polities and ethnic groups throughout the areas of former control. Throughout the entire South Central Andean region, the primary archaeological indicator—ceramics—displayed a marked homogeneity during the Tiwanaku Expansive Period; but the post-Tiwanaku periods are characterized by vigorous local traditions that are evident in design motifs, shape, color, and overall assemblage characteristics. Similar differences may be detected in settlement patterns and domestic architecture.

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Presumably, this material heterogeneity corresponded to differences in other nonmaterial aspects of post-Tiwanaku cultural life.

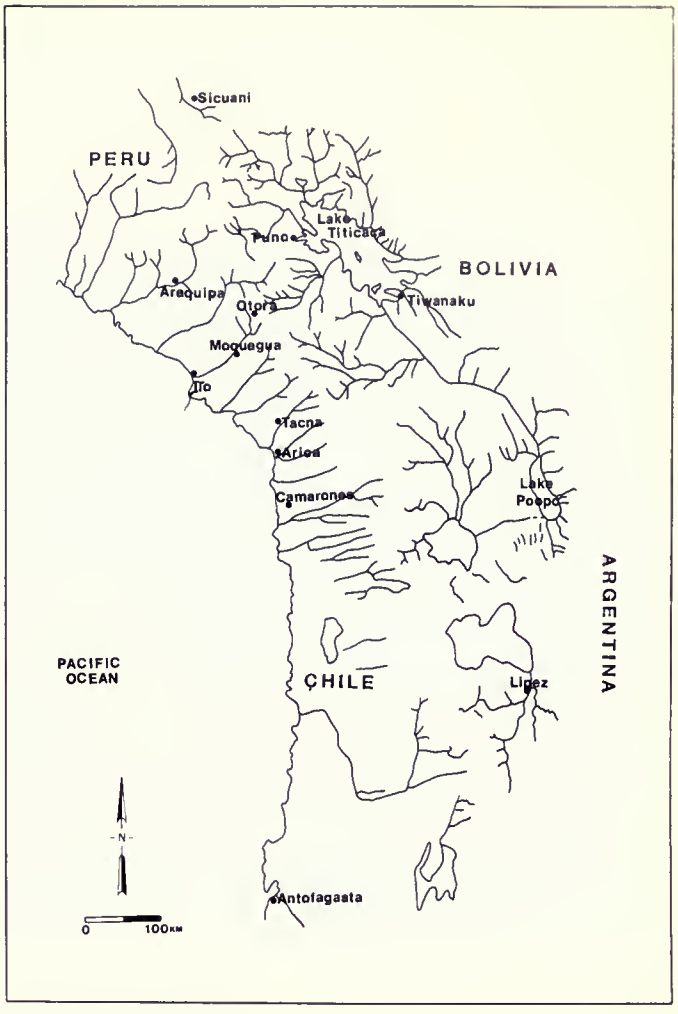
The post-Tiwanaku periods in the South Central Andes represent almost 500 years of intensive cultural growth and elaboration after the collapse of a major pre-industrial empire. The diversity of political systems, economic networks, art style, artifacts, and other cultural features in this region are as vast and complex as any in the prehispanic New World. A major methodological and conceptual problem for prehistorians, therefore, is how to approach this complexity in the archaeological record. In the past two decades, Andean scholars have developed a conceptual framework, known as zonal complementarity, which provides us with a means to understand these vast and complex changes that have occurred through time.

Zonal Complementarity in the South Central Andes

Throughout the history of modern archaeological scholarship of the Titicaca Basin and South Central Andes, one major theme consistently stands out: the lake settlements did not exist in isolation but depended in large part upon access to the ecologically diverse areas of the lower valleys in surrounding regions. That is, the political and economic fortunes of the Titicaca Basin populations through time depended in large part upon their ability to construct and maintain interregional networks throughout the surrounding ecological zones.

The process whereby Andean societies politically control populations (or access to their goods), located in different ecological zones in an effort to ensure a diversified economic base, is known as "vertical control," or "zonal complementarity," in the anthropological literature. The basic premise of verticality begins with the stark nature of Andean environments in which productive regions are largely a function of altitude. Communities seek to "complement" their economic base by gaining access to different altitudinal zones. Over time, the hypothetical result of such a process is a patchwork of colonies and/or alliance networks throughout the surrounding region, connecting diverse ecological areas into a single, productive, and "complementary" whole.

This model of Andean political economy was first suggested by a geographer named Carl Troll in 1931 and developed by the Andean scholar John Murra in a series of articles and books beginning in the 1950s. Subsequent research by later scholars has expanded our empirical knowledge and refined our conceptual tools. Zonal complementarity has since become one of the most powerful theoretical means of understanding the history and process of indigenous Andean political economies.



The South Central Andes

Since its original formulation, zonal complementarity has been expanded to include a wider variety of regional interrelationships. We now speak of "direct" versus "indirect" control, which occur in a number of cultural and temporal contexts. Direct control is an example of the classic colonization process which involved the actual geo-political control of territory outside of the Titicaca Basin. Indirect control, on the other hand, refers to a series of mechanisms involving interzonal contacts between politically and/or ethnically independent groups. Examples of indirect mechanisms include elite marital alliance, established trading partners, military alliances, and so forth.

The structure of zonal complementarity mechanisms in various contemporary and ethnohistoric pop-

View of the Torata Valley, south of the Otora. Lupaqa colonies were located here, according to the visita of Garci Diez. Photo by C. Stanish.

ulations of the South Central Andes has been considerably researched. The dynamic or historical aspect of zonal complementarity, however, remains considerably less well understood. In an effort to define the changes in regional political economic configurations as understood under the concept of zonal complementarity, a series of archaeological research projects were developed and were (or are) being conducted in the Moquegua Valley of southern Peru.

Moquegua is an ideal area to test verticality models because it is prominently mentioned in the Garci Diez de San Miguel Visita* of 1567 as an area in which Titicaca Basin polities held agricultural lands. This splendid document was the final report of a crown official to the Spanish Court on the status of the Lupaqa kingdom in the pre-Toledo Colonial Period. In his report, Garci Diez indicated (at least 23 times in fact) that the Lupaqa had sent *mitimae*, or colonists, to grow maize and wheat in the lower elevations of the Moquegua Valley, crops that cannot be grown in the high, cold plateau country of the Titicaca Basin.

This pattern of Lupaqa colonization of the maize-producing zones outside of the Titicaca Basin during the Spanish Colonial Period has been used as a model for the prehispanic periods in the Moquegua Drainage and other coastal valleys. This region, therefore, serves as an ideal area for testing the nature of zonal complementarity mechanisms through time.

The Moquegua Drainage is one of the southernmost valleys of Peru. Located at 17° latitude, the drainage is bounded by the deeply incised Tambo Valley on the north and the smaller Rio Locumba to the south. Rivers and tributaries of Moquegua stretch from the town of Ilo on the coast to the 5,000-meter peak of

*A "Visita" was an inspection of a royal province by any crown official. The reforms instituted by Viceroy Toledo are considered an historical watershed in Andean society and were accompanied by profound changes in the cultural life of the native populations.

Nevada Arundane, a distance of less than 125 km. Several tributaries of the principal river are found in the upper sierra. One of these valleys, known as Otora, was selected for intensive archaeological investigations in order to test the model of zonal complementarity in the Moquegua Drainage.

A Test of Zonal Complementarity in the Otora Valley

The Otora Valley was chosen on the basis of preliminary investigations for an intensive archaeological investigation of the nature of prehispanic zonal complementarity. The valley contained numerous archaeological sites, including several that were dated to the immediate pre-Inca periods by other investigators. The existence of pre-Inca sites therefore raised the possibility of testing zonal complementarity through time; that is, a test of the dynamic or historical component of the model in an area ethnohistorically identified as an important zone of Titicaca Basin colonization in the Spanish Colonial periods.

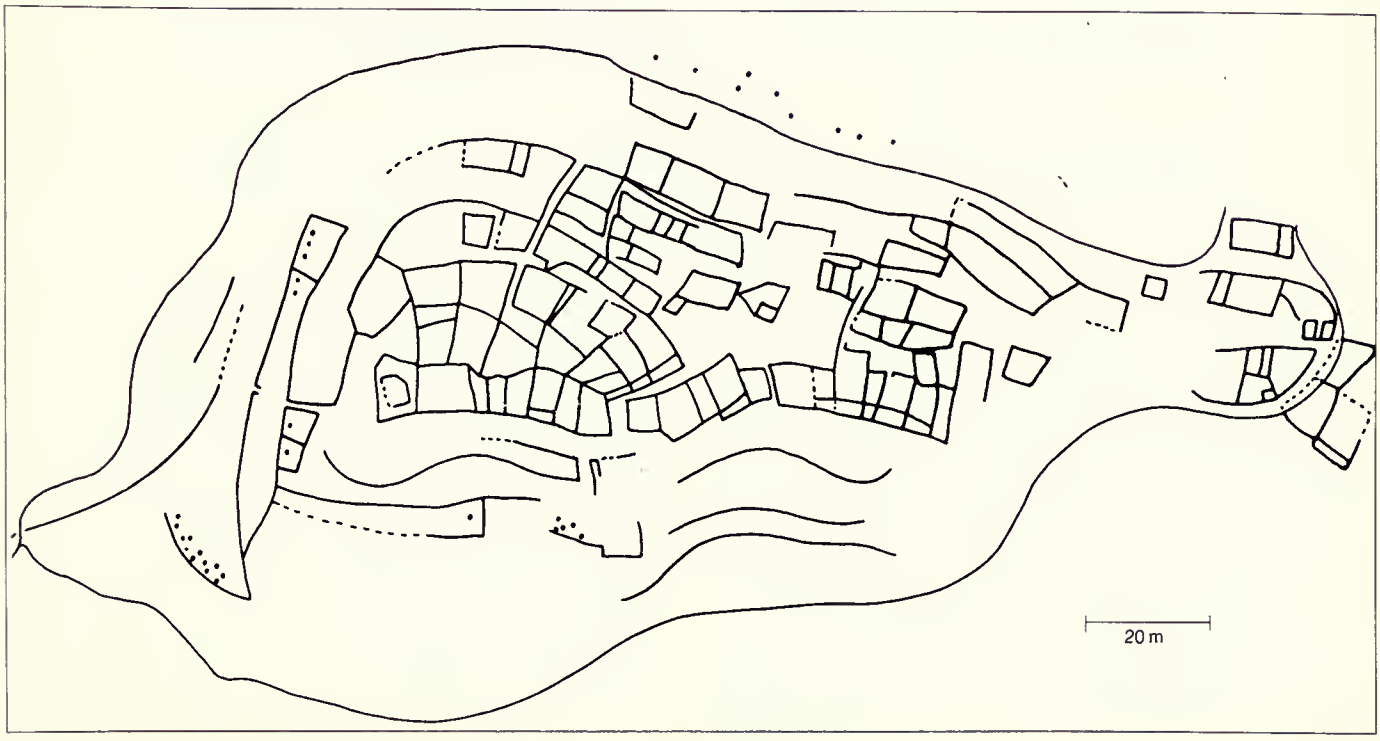
Results of the Otora Investigations

An intensive surface survey located 17 sites in the valley ranging from small sherd scatters to a large pre-Inca site of more than 100 structures (below). Five prehispanic periods were defined on the basis of ceramic and architectural criteria. In each of these periods the settlements in Otora maintained complementary political and economic relationships with the Titicaca Basin and coast. But in each of these periods the nature of the verticality mechanisms differed in fundamental ways. It is this 400+-year history of changing regional political economic configurations that serves to expand our understanding of the dynamics of prehispanic zonal complementarity in the South Central Andes.

The earliest period of human occupation of the valley has only one site. Designated P5 and dated to the Tumilaca Period, it represents a localized and very late Tiwanaku polity in areas of former imperial control. The site is composed of several small rooms located on a small hill or knoll. P5 is completely open and presents no indications of defensive posturing, nor did excavations reveal any offensive weaponry.

P5 is best interpreted as a pioneering settlement during the latest phases of the local Tiwanaku occupation of the Moquegua Drainage and which was founded in an area of high agricultural potential. From a broad, regional perspective, the site is an example of an expansion process into the upper sierra from the earlier and well established settlements in the lower and mid-valley. Embedded within a more complex political system, P5 served to incorporate the Otora Valley into the regional economic system of the local Moquegua Tiwanaku settlements.

The Estaquina Period site of Porobaya (P1)



The subsequent Otora Period falls between the well-defined Tumilaca and Estuquiña Periods (see below) and is represented by at least five, possibly six, sites in the Otora Valley. Three of these sites (P4, P7, and P8) were permanent residential settlements which were intensively investigated. Several other sites (P9, P12, and P16) have been provisionally dated to this period and are special-activity, nonresidential sites such as quarries and corrals.

The site of Cuesta Alta de Otora (P7), is on the flanks of a low hill at the southwest end of the valley where Cerro Cuajone descends into neighboring Paralaque. Cuesta Alta developed directly out of the Tiwanaku hamlet of P5 as it was abandoned, a conclusion based upon ceramic criteria, agricultural canal use, funerary patterns, and domestic architecture. The site is also undefended and was constructed on a very open hill flank; as with the Tumilaca Period hamlet, there is no evidence of inter- or intra-regional competition.

Porobaya Chica, or P4, is a small, undefended residential and cemetery site situated on a small hill several hundred meters up-valley from P7. Excavations at P4 revealed a number of Chiribaya-style ceramic fragments in both domestic and non-domestic contexts. Chiribaya is a post-Tiwanaku polity which developed out of its imperial predecessor. Major Chiribaya settlements are found throughout the Moquegua Drainage, particularly near the coast at Ilo. Porobaya Chica, therefore, dates to the immediate post-Tiwanaku periods and is either contemporary with or slightly later than P7.

The site of Cuajone, or P8, has approximately 16 domestic units located high on the hill of the same name. Like the other Otora Period sites in the valley, Cuajone is unfortified and there was no other independent indication of regional or local competition. Its hilltop location can be explained as the attempt to be near the extensive terraced fields immediately below the site. On the basis of several decorated ceramics, architecture, and tomb styles, Cuajone was also dated to the immediate post-Tiwanaku periods of the Moquegua Drainage.

Regional Political Economies As Reflected in the Otora Valley

Period	Sites	Political Economy
Colonial	P10, P11, P14	Spanish colonial ecomienda, Toledo Reducciones, Lupaqa colonies in Torata Valley.
Inca	P11, P13, P15	Imperial administration with marked Lupaqa influence. Major Inca-Lupaqa site in Torata Valley.
Estuquiña-Inca	P1, P3, P6	Independent polities engaged in intensive interzonal exhange. Marked Colla influence from Titicaca Basin. First evidence of Inca influence in valley.
Estuquiña	P1, P2, P3	Independent polities engaged in intensive interzonal exchange. Probably Colla influence from Titicaca Basin.
Otora	P4, P7, P8, P9, P12, P15	Multi-ethnic colonization by Titicaca Basin and coastal polities. Chiribaya and Colla influence.
Tumilaca	P5	Colony of local Tiwanaku settlers from middle and lower Moquequa Valley.

The domestic architecture of P8 is quite distinctive from that of P5, P7, or P4. On these latter three sites, there is a fairly consistent pattern of rectangular, joined structures built on artificial terraces. On P8, however, the household architectural pattern consists of joined pairs of one large and one small room, which are further grouped into larger complexes spatially segregated from each other. There also seems to be a common patio area outside of the room complexes. It is curious that in the area of all Otora Period sites, there is ample room to build houses on either flat or steep land. The decision to terrace the residential area with individual household units or with clustering structures is one not dictated by topographic considerations, but by cultural choice.

Continued on p. 23

Migrating Canada geese at dawn

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Spring Bird Migration At the Foot of Lake Michigan

by KENNETH J. BROCK

A Field Museum Feature On Local Natural History

"It's for you!" my wife called from the kitchen. My response was immediate and excited. May is a time when the woods abound with birds and the sightings of rarities reach a crescendo; a time when early morning phone calls invariably bring news of some extraordinary discovery. It was, therefore, with great anticipation that I grabbed the phone. "Ken, this is Pete. Get over to the harbor, a big wave has hit the lakefront." This message, couched in birder jargon, translated into "the lake Michigan shoreline at Michigan City Harbor is awash with migrating birds." The voice belonged to my good friend Peter Grube and his measured excitement revealed that something quite unusual was occurring.

Within minutes I joined Pete at Washington Park, a small lakeside park adjacent to Michigan City Harbor. Trees within the park were alive with flycatchers, war-

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blers, vireos, and orioles. Flocks of sparrows covered the lawns and every shrub sheltered a thrush or wren. Our attention was focused on the birds within the park; consequently, almost an hour passed before we noticed that hundreds of birds were still in the air, migrating westward along the shoreline just above the treetops.

To better observe the airborne migrants we moved north of the Northern Indiana Public Service Company plant. This proved to be an especially good vantage point as the migrants, forced to veer northward around the power plant, converged into a narrow stream almost directly above our heads. Although most of the birds flew several yards above the ground, a few were at eye level.

Periodically, a bird landed in the nearby cottonwood saplings, allowing us a leisurely look; but most were seen only fleetingly as they passed overhead. Only the distinctively marked birds could be identified in

Birdwatching: How to Prepare Yourself

The best places to observe spring bird migrants are as varied as the migrants themselves. For a thorough listing of good birding sites, how to find them and what birds to expect, an excellent source is *Chicago Area Birds* by Steve Mlodinow (published 1984 by Chicago Review Press). This work provides detailed maps and descriptive material on the best birding sites in the Chicago area.

Migration observers will also need binoculars to assist in viewing the birds. A number of excellent instruments are available on today's market; unfortunately, a complexity of technical nomenclature often overwhelms beginning shoppers. There is no "best" binoculars for birding; instead, several closely related factors, each of which is maximized only at the expense of others, are involved.

There are two main types of binoculars: roof prism and porro prism. The former type has straight barrels, the latter has off-set barrels in which the objective (front) lenses are further apart than the eyepieces. Advantages of the roof prism design are generally higher quality optics and lighter weight; disadvantages include greater cost (for top quality) and limitations on the closest focus distance. Porro prism binoculars are usually less expensive and able to focus to within 12 feet. Their construction does incorporate extra glass (the porro prisms) and accordingly they are typically heavier than roof prism binoculars.

Optical power is important to consider in choosing a binocular. Binocular "size" is described by two numbers that are usually stamped on the instrument, for example, 7 × 35. The "7" represents the magnifying power, in this case reducing the observer-to-bird distance by 1/7. Clearly, the larger the magnification the closer the bird will appear. Unfortunately, as with cameras, magnification also narrows the field of view and amplifies the unsteadiness of your hand; generally, magnifications greater than 10 cannot be used without a steady rest. The second number, "35," gives the diameter (in millimeters) of the objective lens. The larger the objective lens the more light collected and the brighter the image. On the down side, big objectives increase two undesirable factors, weight and cost.

Together, these two numbers determine the light gathering capability (exit pupil) of the binoculars. Exit pupil is obtained by dividing the first number into the second, that is 35/7 = 5. Binoculars with exit pupil below 5 are generally unsuited for birding, especially for deep woods, early morning, late evening, or cloudy days. Modern technology has provided a partial solution to the light-gathering problem through the development of optical coatings. Coated optics allow more light to pass through the lenses, thereby increasing the light gathering by about 22%.

One possible way around this number game is to use zoom binoculars (variable magnification). Unfortunately, reports on zoom instruments are not favorable. They tend to be bulky and highly subject to defects.

How then do you choose your binoculars? The best approach is to try several different models and magnifications. If possible, join an organized field trip; the participating birders are usually willing to let you test their glasses. Most birders usually start with 7 × 35 porro prisms, but many ultimately graduate to 10 power glasses. A recent survey in Great Britain, where birders are notoriously meticulous, reveals that the most popular instrument by far was the Zeiss 10 × 40 BGAT (roof prism). The B refers to binoculars with fold-down rubber eye-cups for viewing with eyeglasses; GAT means the binoculars are coated with rubber for shock protection.

flight. Small groups of fiery orioles streamed past, occasionally pausing to call from the saplings. Garish scarlet tanagers and flashing rose-breasted grosbeaks were detected in the current. Raucous scolds announced the presence of boisterous blue jays within the seemingly endless flow. Also recognized were scores of darting swallows, compact flocks of cedar waxwings, numerous blackbirds, several eastern kingbirds, and a sprinkling of bobolinks. The vast majority of the migrants, however, remained unidentified as they disappeared quickly from view. No attempt was made to count the birds, but they passed at a rate of easily several hundred per hour. I recall thinking how perfectly Lewis Carroll's memorable words fit the solution:

And thick and fast they came at last,
And more, and more, and more

Careful counts in recent years have yielded incredible results: 1,370 cedar waxwings in slightly more than an hour, 1,055 American goldfinches in four hours, 122 northern orioles during a single morning, and 104 indigo buntings in less than three hours. Even higher tallies have been made on the lakefront in nearby Berrien County, Michigan. May flights of 20,000 blue jays, 5,000 cedar waxwings, 600 northern orioles, 150 eastern kingbirds, and 100 rose-breasted grosbeaks have been reported at the latter site.

The thrill of watching a massive lakefront flight is enhanced when one realizes that most of the passing birds began their marathon weeks earlier in some remote tropical jungle. Slight changes in the sunlight there triggered cryptic stirrings, announcing the time to head north. Answering the call of subtle changes in blood chemistry, the birds took flight. Their journey might have carried them on an island-hopping course across the Caribbean or perhaps they skirted the Gulf, along Mexico's east coast. Some may even have taken the very risky flight directly from the Yucatan over the Gulf waters to the Texas coast. Regardless of the route, each has its perils.

Baltimore oriole

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Indigo bunting

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Why a one-third-ounce warbler would leave a cozy rain forest and face the rigors of a 5,000-mile round-trip journey fraught with hazards, poses an intriguing question. Untold numbers doubtlessly perish along the flyways and many of the survivors arrive greatly emaciated. However, the northern latitude advantages of long summer days, abundant food supplies, and low nest-site competition, apparently render the risks worthwhile. Despite the many dangers, the migrants sing enthusiastically, perhaps with visions of balmy summer days in Canada, as they transit our area.

A second question lakefront watchers might pon-

der is how the birds navigate the migratory track. Accounts of banded birds returning to the same nesting site year after year after year abound; some birds apparently also select the same winter territories. Color-banded golden plovers, for example, wintered on exactly the same Honolulu lawns for several years in a row. How do the migrants find their way between wintering and breeding grounds with such unerring precision? Studies suggest that birds have several modes of navigation, including celestial (using both the sun and stars), magnetic, and visual (following conspicuous geographic features, called "leading lines"). This navigational system redundancy apparently greatly increases the chances of a successful flight.

Reversed migration is an intriguing local phenomenon in which birds fly in the wrong direction. Several southwestward flights have been observed in the springtime along the lakefront at Michigan City Harbor. Oddly, in each case the birds flew almost directly into a strong headwind. In addition to the disadvantage of struggling against a headwind, the southerly component of this course carried the birds southward, seemingly the direction opposite to that desired by spring migrants. The cause of this odd behavior remains obscure, though some authorities suggest that it may be related to wind direction.

The spring migration of birds at the foot of Lake Michigan often begins with the appearance of ducks when the ice breaks in late February. The arrival of meticulously plumed ring-necked ducks on the freshly opened ponds is a certain harbinger of spring. The ducks are closely followed by loons and grebes on the deep waters of Lake Michigan. By late March, phoebes, vanguards of the passerine ("perching bird") migration, seek insects in sheltered woods, and in early April the first hermit thrushes peer covertly from dense thickets. March and April are also the months in which migrating hawks cleave the zephyrs above the Indiana Dunes.

Throughout April the migration rapidly gains momentum. Enormous flocks of red-breasted mergansers appear on Lake Michigan and we see the arrival of the warblers. The zenith of the passerine flight occurs in May, as untold millions of small birds pass through, especially on clear nights with southerly breezes. By mid-June the migration is virtually complete, though a few stragglers may linger until almost July. By this time the

Scarlet tanager

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first fall shorebird migrants are already southbound. Thus, spring migration, which is really the composite of many smaller migrations, spans at least four months.

Across much of the Midwest, observers rarely have the opportunity to observe actively migrating birds; more often, resting or feeding birds are noted only as they briefly pause in their journey. The shores of Lake Michigan provide a notable exception to this rule; daytime migrations occur regularly along the lakefront. In addition to the teeming flights at Michigan City Harbor, numerous diurnal migrants can be observed from the sand dunes in Indiana. From the dune brow, birders are often treated to an almost continuous procession of migrants.

March flights can yield calling killdeer, hundreds of robins and clouds of blackbirds. Eighty-three migrating eastern bluebirds, detected by their mellow calls, were once counted on a single morning. April brings hordes of swallows, flickers, and meadowlarks. Hundreds, even thousands, of these species have been observed from the dune crests in a single day. Some species normally regarded as sedentary are occasionally also noted migrating along the dunes. Black-capped chickadee flights, with counts numbering in the hundreds, and blue jay counts of four figures, have been recorded by dune-top observers.

These longshore flights underscore Lake Michigan's powerful influence upon the migrating birds. The water-land boundary in concert with idiosyncrasies of the passerine migration effectively concentrates these small birds along the lake's edge. At least two concentrating mechanisms seem to operate along Lake Michigan's shores. The first mechanism accounts for the longshore flights. Migrating birds are known to follow geographic leading lines, including rivers, mountain ranges, and seacoasts. In our area the shores of Lake Michigan form prominent leading lines, creating airways along which myriads of birds navigate. Although Lake Michigan's leading lines are probably far more important in fall than spring, they almost certainly account for the diurnal flights observed in spring.

A second concentrating mechanism might be termed the lake-edge effect. Most migrants apparently prefer to fly above land; however, in the darkness of night many are swept out over the lake. There are numerous instances of passerines landing on ships or boats far out on Lake Michigan. Small birds stranded over the lake at sunrise make the nearest shore, where they often descend immediately upon gaining landfall. This produces an unusually high density of small birds in lakeside parks and woods.

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The best time to observe warblers is in early morning. The magnificent Blackburnian warbler is most often sighted in early May.

The lake-edge effect is further enhanced if the parks or woodlands are isolated by factories or urban development. Under these circumstances the birds crowd into the scant cover available within these oases. Thus, heavy flights can transform unlikely sites such as scrubby lakefront woodlots or lakeside parks into cauldrons of birding activity. Chicago birders have long recognized the extraordinary quality of these locations; indeed, highly productive sites have been christened with special names — for example the "Magic Hedge" at Chicago's Montrose Beach — reflecting their birding potential.

Weather plays a strategic role in migration, especially on the regional scale. Radar studies indicate that the relatively weak flying passerines are primarily nocturnal migrants. Flights of these birds are most intense

The arrival of ring-necked ducks on the freshly opened ponds is a certain harbinger of spring.

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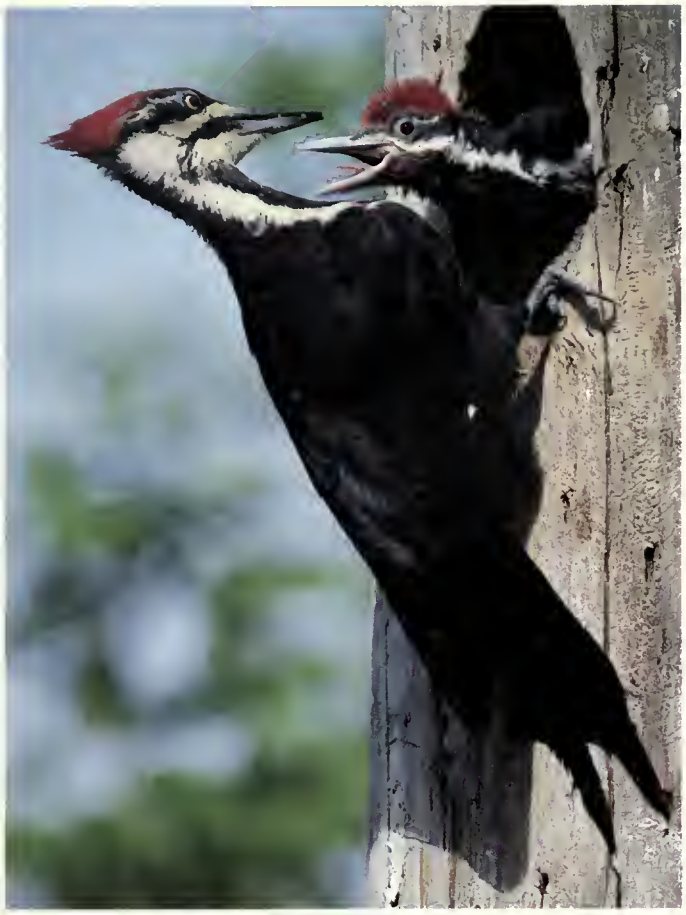

Pileated woodpecker

Copyright © 1981 Gregory Scott/Photo Researchers Inc.

on clear nights when trailing winds are available. Fair skies and southerly winds generally prevail ahead of cold fronts, while north winds and inclement weather follow frontal passage. Accordingly, heavy spring flights usually precede a cold front and migration often stalls after the front passes. The northward movement of passerines from the Gulf of Mexico can then be visualized as a leapfrogging action, orchestrated with passing frontal systems. This irregular progression often sweeps the birds into broad accumulations called waves. Once formed, a wave presses northward under favorable conditions and is grounded during adverse weather. So it behooves the birder to carefully monitor spring weather conditions; the reward of being inundated by a heavy migratory wave is well worth the time required to scan daily meteorological reports.

Although the lake-weather alliance provides a migratory spectacle along the lakefront, it also holds a dark side. There are many accounts of massive bird kills on the lake. Among the most noteworthy occurred April 16, 1960, when a powerful thunderstorm developed over Lake Michigan during the night. In the next few days more than 3,900 dead birds washed up on eleven miles of Indiana's beaches (remaining shoreline was not surveyed). The most common species found was the junco, but several rare species, including a saw-whet owl, 14 yellow rails, 32 Henslow's sparrows, and 10 LeConte's sparrows were also among the casualties. Clearly, storms take a devastating toll.

With the exception of Lake Michigan's beaches, which regularly attract ruddy turnstones, sanderlings, semipalmated sandpipers, and dunlin, there is precious little reliable shorebird habitat in our area. Large numbers of shorebirds do traverse southern Lake Michigan, however, and these birds are notoriously opportunistic. If spring rains create suitable habitat, shorebirds can appear almost anywhere. In 1978, for example, heavy rains flooded an athletic field in Gary. Taking full advantage of these new mudflats were hundreds of pectoral sandpipers and yellowlegs, scores of dowitchers, a few Wilson's phalaropes, and a single Hudsonian godwit. Birders from as far away as Indianapolis and Fort Wayne came to see the godwit; detailed directions to the bird included the final instruction, ". . . then look under the yellow goalpost."

The wood warblers, called "butterflies of the bird world," by Roger Tory Peterson, are the essence of spring migration. These delightful woodland birds are in crisp breeding plumage as they arrive fresh from the Central and South American jungles. Warblers feed almost exclusively on insects; consequently, their arrival coincides with the leafing and blossoming of local plants, the "real springtime" in the minds of many. Warblers also appear about the time most residents of the frost belt are thirsting for their first post-winter walk in the sunshine. So it is not surprising that warblers are the most popular of all spring migrants. For many birders the sighting of a splendid Blackburnian, on a frosty morning in early May, renders the entire migration a roaring success. The fascination with warblers is also reflected by the common practice of gauging birding quality by the number of warbler species observed in an outing. In mid-May a count of 15 is about average, 20 constitutes a fine day, and a "25 warbler day" approaches the ultimate.

The earliest spring warbler, the yellow-rumped (formerly myrtle warbler), can be expected during the second week of April and is a welcome sight after a long hard winter. The most intense warbler flights occur in mid-May and a few species, the furtive mourning and Connecticut warblers for example, do not pass through until the last week in May.

Like most passerines, warblers are nocturnal migrants; birders afield at sunrise may well observe the "fall

out" as these tiny birds descend into the trees. During the day they typically forage in loose flocks that invariably contain several different species. These flocks, which can usually be located by songs and chips, comprise the key to spring warbler watching. Birders search for a flock, then follow the flock until each bird has been examined.

For many northwestern Indiana birders the March-April hawk flights are the highlight of spring migration. The excitement of a dozen buteos soaring overhead or a sharpie streaking past so close that its yellow eyes are visible without the aid of binoculars, draws them back to the hawk-watch sites year after year. The occurrence of spring hawk flights represents another artifact of Lake Michigan's presence. Migrating hawks normally waft cross-country on clear spring days with southerly winds. The raptors do, however, have a strong aversion to flying over broad expanses of water; consequently, upon reaching Lake Michigan they abruptly alter course to avoid the lake. As a result, the hawks accumulate along the lake, forming a narrow flight corridor that roughly parallels the shoreline. This effect seems most pronounced on the southeastern corner of the lake; spring hawk flights are rare in Chicago and Gary.

The passing hawks can be easily observed from the sand dunes along Indiana's eastern lakeshore. Any vantage point allowing a wide view of the surrounding area will suffice, but the two most popular Indiana sites are Mount Baldy and Johnson Beach; both are within the Indiana Dunes National Lakeshore. The latter consists of a stabilized dune immediately west of Indiana Dunes State Park. On some days when winds seem favorable, hawks fail to appear; observers do get skunked. These disappointments are more than compensated for when a "good" flight occurs. Good daily counts consist of 200 to 300 birds; the largest recorded single day count was slightly less than a thousand hawks. The most common species are red-tailed, sharp-shinned, and broad-winged hawks, but all of the regular species, including northern goshawk, golden eagle, and peregrine falcon, have been observed. An additional bonus of dune-top hawkwatching is that the birds sometimes pass remarkably close, allowing excellent views. Adult goshawks, red eyes blazing, have passed within 75 feet of observers on the dune coast.

The heaviest Indiana flights generally occur on clear days when moderately strong winds blow from the south. These are of course fine days to be outdoors; hawk observers often take lawn chairs, a thermos of coffee, and sunglasses and enjoy the day atop a dune. In addition to the hawks, the aforementioned longshore migrations can be simultaneously enjoyed. Almost everything can appear; I still recall my delight when a pileated woodpecker flew past on a clear April morning.

Even larger spring hawk flights have been observed in Berrien County, Michigan, where local experts Roy Smith and Walter Booth have recorded single day counts exceeding 4,000 birds. These heavy flights consist mainly of broad-winged hawks, but daily counts of 300 to 500 sharp-shinned hawks and 100 northern harriers have also been tallied. In contrast to Indiana, where southerly breezes bring the hawks, the best Michigan flights take place on days with east winds, which apparently sweep the soaring birds up against the eastern shoreline.

An exciting element in watching the spring migration is the possibility of spotting a rarity; indeed, it is the dream of most serious birders to discover a truly rare bird. Rarities are species that do not normally occur in our area, though they may be common in other parts of the country. Southern Lake Michigan seems to have a magnetic attraction for these wanderers, as a surprising number of rare birds have appeared over the years. Exotic species that have been identified along or near the shores of southern Lake Michigan during spring migration

Passing raptors, such as this red-tailed hawk, may be observed from the sand dunes along Indiana's eastern lakeshore.

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include: magnificent frigatebird, white-faced ibis, garganey, common eider, purple gallinule, common black-headed gull, arctic tern, Say's phoebe, scissor-tailed flycatcher, sage thrasher, Virginia's warbler, western tanager, painted bunting, Brewer's sparrow, and lark bunting.

Rarities appear at the most unexpected moments and locations. I recall one May morning when I was struggling to identify a western sandpiper through the telescope. My efforts were continually thwarted by another sandpiper that kept walking directly across my line of sight obscuring the view. Finally, out of frustration, I took a look at the intruder, which turned out to be a curlew sandpiper; the first ever recorded in Indiana. On another occasion, observers in Chicago's Olive Park noted an unusually drab, nondescript sparrow working the grassy strip at the north end of Navy Pier. Identification of this bird proved to be quite perplexing; finally, with help of Sebastian Patti and Jim Landing it was mist-netted and examined in hand. Measurements and photographs, taken before the bird was released, proved that it was the first Cassin's sparrow ever reported in the Mississippi Valley.

My favorite rarity story, however, involves another of those early morning phone calls in May. This time the caller spoke breathlessly in a voice that contained an element of uncertainty, "Ken, I'm phoning from the parking lot at Michigan City Harbor. I'm almost certain that I have a singing Kirtland's warbler by the yacht basin." If true, this was a phenomenal report; Kirtland's warbler is a bird that is truly rare, not just an out-of-range common bird. Only about 400 individuals of this endangered species remain. The caller was Tim Coslet, a birder with keen ability but only limited experience. Tim's answers to several specific questions convinced me that his identification was indeed accurate.

A quick drive to the harbor revealed a male Kirtland's warbler hopping on the beach and flitting about the small shrubs along the thin strip of sand that separates the yacht basin from Lake Michigan. Periodically the bird gave forth its ringing song. The warbler was remarkably tame; photographers could easily approach so close that they were unable to bring cameras into focus. On one occasion, during a brief rainstorm, the bird hopped to within ten inches of the boot of an admirer. The warbler remained on the beach for two days, during which scores of observers enjoyed its presence; it became known as the "friendliest bird on the beach."

Jim Bull, a staff naturalist for the Indiana Dunes National Lakeshore who has a penchant for the Kirtland's warbler, took the bird under his wing, so to speak, monitoring it throughout the daylight hours of its stay. Jim was concerned that the trusting bird might be snapped up by a dog or stepped on by a passerby as it hopped on the sidewalk. The story apparently has a happy ending. After seeing that the warbler was properly tucked in on the second evening, Jim was unable to locate the bird at sunrise on the following morning. Presumably, it continued northward to join others of its kind on the Michigan breeding grounds. FM

Scissor-tailed flycatcher

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Kirtland's warbler

Texas Mushrooms Come to Field Museum

by Gregory M. Mueller, Assistant Curator, Mycology

photos by the author

One would not normally think of Texas as a paradise for mushroom hunters or as a place where fungi can be found in abundance. When most people think of Texas, they conjure up thoughts of barren deserts with cactus, not dense forests with mushrooms. In southeast Texas, however, there is an area of moist forests called the Big Thicket, complete with wildflowers, mosses, and mushrooms. This area extends from the Trinity River east to Beaumont and up to Livingston and Jasper in the north. Within this area are ten major plant associations including bogs, swamps, hardwood stream bottoms, magnolia/loblolly pine forests, and arid sandy lands. Each of these habitats has its own particular mushroom flora and thus is truly a mushroom-hunter's paradise.

Unfortunately, we do not know much about the mushrooms and other fungi that inhabit this area or even what fungi grow there. Most mycological fieldwork in this country has been performed in the cool, relatively snake-free, northern states. The fungal collections at Field Museum, and most other herbaria, are well supplied with fungi from the Northeast, Great Lakes states, and Pacific Northwest, but few herbaria have a significant collection of fungi from the Gulf Coast states, including east Texas.

With the receipt of the first shipment of east Texas mushrooms from Mr. David Lewis, the first step to rectifying this problem here at Field Museum has now started. Dave Lewis is a chemist by profession and an avid mycologist by avocation. He has been collecting fungi for 12 years. During this time Dave has accumulated one of the finest and largest collections of fungi from east Texas. This collection of approximately 4,000 specimens is especially strong in specimens of the genus *Amanita* and of members of the Boletaceae.

Amanita muscaria, the fly agaric, beautiful but nonedible, occurs over a wide area, including the Midwest. The bright red cap is dotted with white patches.

Dave received a MS degree in biology from Lamar University, for which he undertook a floristic survey of the mushrooms of the Big Thicket. He has done further graduate work at Texas A&M on boletes (pore mushrooms) of east Texas. He is a founding and very active member of the Texas Mycological Society and a strong proponent of mycologists increasing their study of Gulf Coast fungi. Dave decided to place his valuable collection in a major museum because he wanted to ensure that it would be available for study by scientists from around the world and that it would be well maintained. Field Museum was chosen as the repository because it is acknowledged as an international center for mycology and it has a long-term commitment to build upon its already fine mycological holdings.

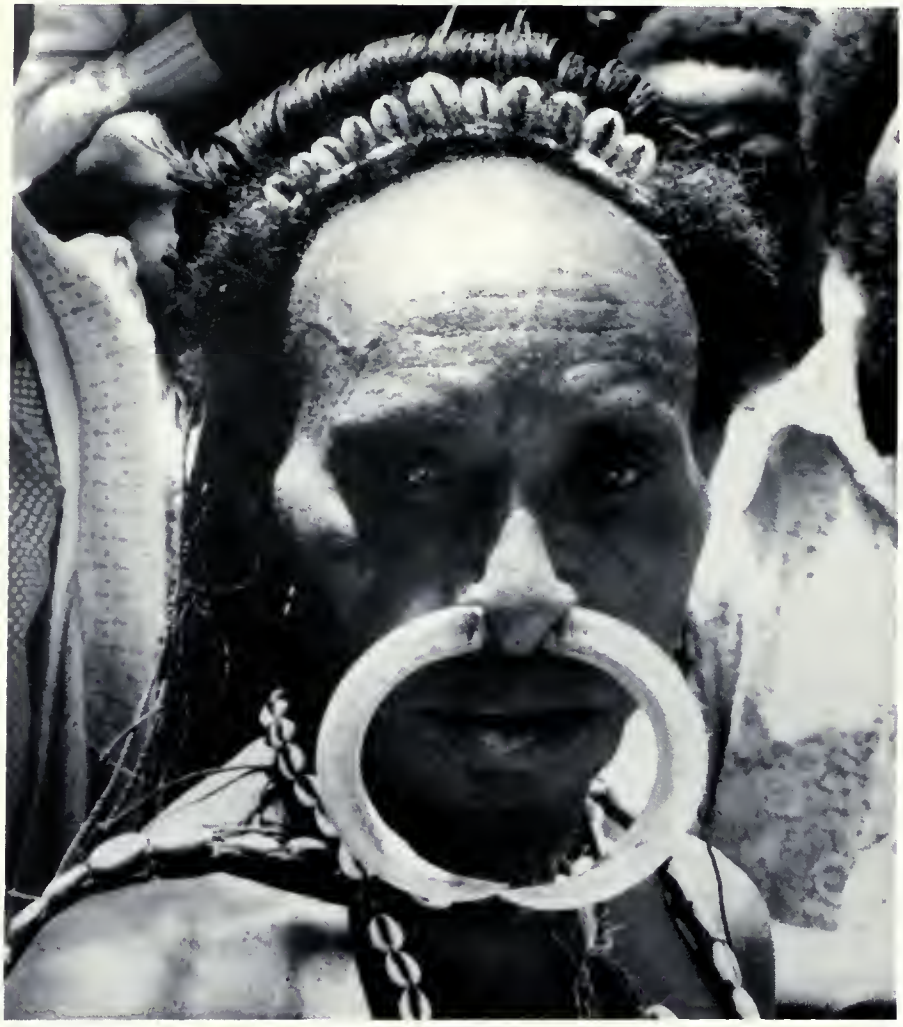
David Lewis (rt.) with author, at Big Thicket National Preserve, Texas.

A collection such as the one being donated to Field Museum by Dave Lewis is of great scientific value. Well documented herbarium specimens that were collected over a number of years are necessary for scientists to determine what occurs in a particular area, what changes in species distribution has occurred over a period of time, and to make conjectures regarding the ecology and interspecific relationships of the organisms. Such collections are also essential to scientists who are revising the taxonomy of specific groups of fungi. The work done so far on Gulf Coast fungi indicate that there are numerous species not yet known to science or not yet reported from the U.S.A.

To give an example of our state of knowledge regarding Gulf Coast fungi, let us look at the first shipment of specimens that Field Museum has received from Dave Lewis. The first batch consisted of 225 collections of the genus *Amanita*. *Amanita* is one of the most easily recognized genera of mushrooms. It contains probably the most photographed mushroom, the fly agaric, *Amanita muscaria*. Almost everyone has seen a picture of this species with its bright red cap covered with pure white patches, obvious ring on the stem, and cup at its base. This genus also contains some of the most deadly mushrooms; the majority of mushroom-caused deaths in the U.S. are attributable to species in this genus. One would assume, therefore, that the identity and taxonomy of such a showy and important genus would be completely worked out by now. This, however, is not the case. In a paper that Dave Lewis co-authored on the *Amanita* of the Big Thicket (*The Southwest Naturalist*, vol. 26, 1981), 23 species were reported, 13 of these being reported from Texas for the first time. In this paper, Dave also reports that there are several groups in the genus that need further study and that very likely there are many more species than the 23 he reported. The North American expert on the genus, Dr. David Jenkins at University of Alabama, Birmingham, believes that the southeastern U.S. may have the greatest diversity of *Amanita* species of any similar size region in the world and that there are probably many "new species" in the Gulf Coast area. Further collecting and an exhaustive study of major collections such as Dave Lewis's will be necessary before we know how many currently unknown species are in the area. Only time and work will tell how many treasures are included within Field Museum's new acquisition. **FM**

Music and Dance in Papua New Guinea

April 29 through July 12



Sixty-five brilliant color photographs by photographer Jordan Wright, showing traditions and changing lifestyles in Papua New Guinea, will be on display from April 29 through July 12.

The special exhibit, "Music and Dance in Papua New Guinea," combines photography, everyday objects, and tape-recorded traditional music to present one aspect of a little-known people.

The exhibit has been organized by the Smithsonian Institution Traveling Exhibition Service (SITES) in cooperation with the University Museum of Archaeology/Anthropology of the University of Pennsylvania. The show is derived from the more than 4,000 photographs taken by Jordan Wright during the spring and summer of 1982.

The highland people of Papua New Guinea were once divided into hostile tribes that spent much of their time in warfare and ritual preparation for warfare. Dances, elaborate costumes, and colorful body painting were part of this ritual. Today, however, these lavish displays are part of friendly competitions, and serve to preserve cultural behavior.

The photographs in "Music and Dance in Papua New Guinea" convey the warmth and beauty of life today in the Highland Sepik villages of New Guinea. Highlights include exclusive photographs of the Sepik "welcome dance" and a series of photographs telling the story of a marriage.

Jordan Wright's pictures also show the festive events at the annual Mt. Hagen/Goroka Fair—an extravaganza of parading, dancing and singing. The elaborate music and dance competitions shown give evidence of a traditional life that has only recently been touched by contact with the 20th century.

PERUVIAN VILLAGES, *con't from p. 10*

These two architectural patterns represent ideal or normative types of household construction which predominate on each site in the Otora Valley. As with any human settlement, there is variation around this ideal. The first type, as found at P5, P7, and P4 and characterized by domestic terraces, is common on local Tiwanaku and post-Tiwanaku sites throughout the Moquegua Drainage. The second type, as seen at P8 and later sites (see below), has been reported from archaeological settlements in the circum-Titicaca Basin.

These architectural data, the existence of aboveground tomb types, and the construction of an independent canal system, strongly suggest that Cuajone was a colony which originated from somewhere in the northern side of the Titicaca Basin. Likewise, the discovery of decorated and plainware Chiribaya Pottery at P4, canal placement, and similarities to domestic architecture at known Chiribaya sites suggests that it too was a colony, in this case one which originated from the lower Moquegua Drainage. Presuming the validity of this reconstruction, the existence of these two colonies alongside P7—a local settlement which developed out of the earlier Tumilaca Period hamlet—makes the Otora Period in the valley a classic instance of multi-ethnic land use in a prime agricultural area—a circumstance hypothesized by J. Murra in his formulation of verticality models. The Otora Period would therefore seem to represent a confirmation of the hypothesis for the immediate post-Tiwanaku periods in the South Central Andes.

Chiribaya polychrome vessel. Courtesy Instituto Nacional de Cultura (Peru)—Tacna.

The following Estuquiña and Estuquiña-Inca periods are named after the type site located in the mid-Moquegua Valley. These periods are represented by four major sites in the Otora and surrounding valleys. The

Excavation of house on Porobaya site in Otora Valley. Photo by C. Stanish.

largest settlement is Porobaya (P1), a fortified, hilltop site with more than 100 structures. Porobaya was the political center of prehispanic Otora and typifies a number of other sites throughout the Moquegua and southern Tambo drainages. The site of Sajena (P3) is almost identical to P1, except that it is smaller and located higher up in the valley. Two other sites in the Otora Valley, Colana (P2) and Paralaque (P6), seem to be slightly earlier and later respectively.

One of the principal means of dating the Estuquiña sites was through analysis of the exotic and decorated ceramics discovered in domestic structure excavations, tombs, surface, and other contexts. Locally manufactured polychrome ceramic pieces are characterized by black and fugitive white linear designs over a burnished, red-slipped surface. This type has been named "Tricolor Porobaya" after the more general ceramic style known as "Tricolor del Sur." The principal exotic ceramic type is Sillustani, a northern Titicaca Basin tradition beginning in the immediate pre-Inca periods and continuing on into the Late Horizon. The second largest class of decorated, exotic ceramics are Inca polychromes. Another style found in Moquegua Chuquito ceramics. This style is associated with the Lupaqa kingdom in the Titicaca Basin when it was incorporated into the Inca Empire. Chuquito polychromes are found in abundance in the large site of Torata Alta south of Otora as well as on the Otora sites of P6, P11, and P13. These are interpreted as being truly Late Horizon in date; that is, contemporary with Inca geo-political control of the Moquegua Drainage.

A chulpa—*stone tower or tomb typical of those found in Otora Valley, ca.* A.D. *1200-1400. Photo by C. Stanish.*

The Estuquiña-Inca period is distinguished by the presence of Inca pottery on sites otherwise characterized by pre-Inca traits, such as fortified, hilltop locations, pre-Inca pottery, pre-Inca tombs, and so forth. One site, known as Colana (P2), has all of these pre-Inca characteristics without having any Late Horizon pottery. It therefore has only the Estuquiña component. The rest of the Estuquiña sites all have later Estuquiña-Inca phases.

The accumulated evidence from the Otora excavations indicates that the Estuquiña period settlements are autochthonous, independent polities which developed out of a multi-ethnic cultural context characteristic of the earlier Otora Period. These sites had a vigorous economic relationship with both the coast and the altiplano as indicated by fish vertebrae and the bones of certain mammals in the kitchen remains. Unlike their ancestors in the Otora Period, however, they were not colonists but independent groups engaged in some form of economic exchange with these other regions.

The intrusion of the Inca Empire into the Otora Valley was accompanied by profound changes in the local culture. Two sites discovered in the valley are interpreted as strictly Late Horizon (*ca* A.D. 1475-1532), local settlements. Both sites have not only Inca Imperial ceramics but also Chuquito polychromes, the style associated with the Lupaqa polity. The architecture on the relatively undisturbed site of Polverin (P13) is similar to the local Estuquiña settlements suggesting that these are indigenous populations who built their sites under Inca supervision. Sites with Chuquito polychromes are found only on the valley bottoms. This conforms to pre-Inca/Inca settlement pattern shifts discovered in other areas of the Andes in which sites were moved to lower, open, and indefensible locations.

Zonal Complementarity as Reflected in the Otora Data

If anything, the data from Otora teaches us that the ancient farmers and herders of the Moquegua region were smarter than the archaeologists trying to study them. They did not conform to the neat scientific models originally proposed to explain strategies to survive in the arid sierras of southern Peru. Rather, the Otora data

indicate that the nature of the local and regional political economies developed by the ancient populations fluctuated throughout the half-millennium of human prehispanic occupation in the valley, demonstrating a sophisticated flexibility in local and regional political and economic organization (chart p. 10). During this time, both direct and indirect vertical control mechanisms operated to economically integrate the altiplano, sierra, and coast, allowing access to their ecologically specific agricultural and natural products. At no period in the entire cultural history of Otora is there any evidence of the valley being economically isolated from neighboring ecological zones. The local economy was, as it is today, dependent heavily upon access to the other regions.

The first phase, Tumilaca, is an example of colonization from the lower Moquegua Valley to control the rich and then unexploited maize zones at a key area with access to grazing lands. The only Otora Valley site, P5, is a colonial extension of the more complex settlement system in the post-Tiwanaku period of the Moquegua Valley.

The Otora Period is a classic example of multi-ethnic colonization of a key maize producing zone in the upper sierra. In the political vacuum created by the collapse of the local Tumilaca Period settlement system in Moquegua and the Tiwanaku Empire in the region as a whole, both coastal and Titicaca Basin polities sent colonists in an attempt to maintain or gain access to this critical area between two major ecological zones.

The Estuquiña and Estuquiña-Inca periods represent the emergence of an autochthonous polity out of the multi-ethnic context of the earlier period. In spite of their political independence, the Otora settlements maintained economic contact or control of the coastal and highland regions. The major external influence in this period is from the northern side of the Lake Titicaca Basin, the area of the Colla polity. The Colla were one of the two major groups the Inca encountered in their expansion into the Titicaca Basin.

After the incorporation of the region by the Inca Empire, the Colla influence was replaced by their bitter rival—the Lupaqa Kingdom. This is evidenced in the Moquegua region by the replacement of Sillustani pottery, associated with the Colla, by Chuquito style sherds, geographically linked with the Lupaqa. The alliance between the Inca and Lupaqa that the chronicles speak of had profound implications for the Moquegua Drainage. The administrative system set up by the Inca was clearly influenced by their allies, the Lupaqa, and is reflected in the overwhelming occurrence of Chuquito ceramics on the Late Horizon site of Torata Alta in the Torata Valley, directly south of Otora. (See "Archaeological Reconnaissance in Southern Peru," by Charles Stanish and Irene Pritzker, in the *Bulletin*, June 1983.)

San Miguel polychrome vessel. Courtesy Instituto Nacional de Cultura (Peru)—Tacna.

As with all scientific research, the Otora investigations raise a dozen questions for each one they answer. The influence of the Lake Titicaca Basin was sustained and intense throughout the entire cultural sequence in Otora. Our future research plans therefore will focus on the Lake region. Specifically, we will initiate field research on the Lupaqa area in the southwestern portion of the Titicaca Basin. There, large sites, far more massive than those found in Otora, were established around A.D. 1200. The Lupaqa eventually developed into the kingdom described in the 16th-century accounts. We will therefore begin intensive research on key Lupaqa sites in an effort to understand the nature of this large polity whose influence reached as far as the small valley in the upper Moquegua Drainage. **FM**

Acknowledgements

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FIELD MUSEUM TOURS

Explore the primeval splendor of the Canadian Northwest.

Field Museum Tours invites you on an expedition to the stunning Northwest, including Seattle, Prince Rupert, Queen Charlotte Islands, Fitzhugh Sound, Alert Bay, Princess Louisa Inlet and Victoria aboard the Society Explorer.

PROJECT CANADIAN FJORDS & INSIDE PASSAGE

Departing:
August 16, 9 Days

August 16, Seattle. Arrive and transfer to our deluxe hotel. After a reception at the University of Washington's Burke Museum, enjoy dinner and Seattle's nightlife.

August 17, Prince Rupert. Depart Seattle on morning flight to Prince Rupert. After a ferry crossing to Prince Rupert, board the *Society Explorer* for an evening departure. Enjoy the captain's welcome dinner as we set sail at sunset for the Queen Charlotte Islands.

August 18-19, Queen Charlotte Islands. Journeying south, we arrive at the unspoiled home of the Haida Indian Nation where braves erected countless totem poles, each carved to tell its special story. Today these moss-encrusted monuments testify to the centuries-old Haida way of life. We explore these islands with their brooding forests harboring ancient villages. Bald eagles, seabirds, Stellar sea lions and whales provide opportunities for rewarding walks and beach hikes.

Society Explorer

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

August 20, Fitzhugh Sound. This morning we sail into the upper Fraser Reach and Grenville Channel for a day of exploration among the magnificent wave-sculpted canyons and craggy inlets of the Canadian fjords. At Kwakshua Inlet, an area rich in abalone and other Northwest sea life, hikers will enjoy exploring the coastal woods of 100-foot stands of red cedar, Sitka spruce, western hemlock and Douglas fir. Our ship sails south into a region of towering cliffs, and rushing waterfalls.

August 21, Alert Bay. Following an afternoon cruising the Inside Passage, our ship puts in at Alert Bay, ancestral island home of the Nimpkish, largest tribe of the powerful Kwakiutl Indian Nation. According to anthropologist Franz Boas, the word Kwakiutl means Smokes of the World, which alludes to their ability to attract huge throngs of people to their firelit potlatches and ceremonials. We'll visit the U'mista Cultural Center/Alert Bay Museum. Here we see fine examples of the distinctive ceremonial masks, utensils and bentwood boxes—important elements of the rich Kwakiutl lifestyle—and have the opportunity to purchase native handicrafts, jewelry and artwork.

After lunch, we'll move into the Queen Charlotte Strait, the summer gathering place for close to 300 killer whales, uncontested top predators of Canada's northern waters. Roaming the protected waters of the Inside Passage in clearly defined pods, males, females and young cooperate in hunting their prey. Killer whales have no natural enemies other than man.

August 22, Princess Louisa Inlet. Passengers experience a realm of snowmelt cascades and 6,000-foot mountains ringing this spectacular horseshoe-shaped fjord. Overhead, bald eagles soar, slicing through the coastal mists with their six-foot wing-spans. At the tumultuous Chatterbox Falls, we'll go ashore to walk alpine meadows full of lupine, dwarf dogwood and chocolate lily. Others may follow the trail which ends at the long abandoned Trapper's Cabin, built in the shadow of scenic Mt. Albert.

August 23, Victoria. Midday arrival in Victoria, British Columbia. Victoria's distinct English flavor is reflected in the copper-domed Parliament buildings heralding our entry into the harbor. This afternoon we tour the Provincial Museum with its comprehensive collection of coastal Indian art and artifacts and its life-sized replica of a 19th-century frontier town. Stroll the cobbled streets, perhaps stopping to sip tea at the ivy-covered Empress Hotel. The captain hosts a farewell dinner tonight as we sail for Seattle.

August 24, Seattle. Morning arrival and connection with homeward flights.

This tour will be enhanced by a team of expert lecturers in the region's natural history, native cultures, and wildlife, including *Dr. Scott M. Lanyon,* Field Museum's assistant curator and head of the Division of Birds.

CRUISE COST PER PERSON

Explorer	$1,790	Boat Deluxe	$2,690
Explorer Deluxe	$1,950	Suite	$3,190
Yacht	$2,320	Owner's Suite	$3,590
Yacht Deluxe	$2,490	Airfare (not incl. in rates)	$190

Rates are per person, double occupancy, and include group transfers, cruise accommodations, all meals including a welcome cocktail and dinner party and farewell dinner, lectures by accompanying or visiting speakers, and all off-ship excursions. Amenities include travel bag, backpack, documentation wallet, comprehensive guide book and daily log. Single cabins are available at 1.5 times the above rates, except single suites which are 1.9 times the above rates. Airfare is approximate and subject to change.

Deposit $500.00 per person

People's Republic of China

September 12 – October 2

Customized Tour exclusively for Field Museum
Organized and accompanied by
Katharine Lee

Stanton Cook, courtesy *Chicago Tribune*

The itinerary for this exceptionally well conceived tour covers the highlights of this fascinating country. We depart Chicago via Japan Air Lines. Our first stop will be Tokyo, where we will enjoy a city tour. Chinese cities to be visited include Shanghai, Wuxi, Beijing, Luoyang, Xi'an, and Guilin, plus a boat ride on the Li River. We'll exit through Hong Kong, a city full of Oriental treasures and cultural heritage. This is a "not to be missed" opportunity.

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FIELD MUSEUM OF NATURAL HISTORY BULLETIN

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COVER

STANLEY FIELD HALL, minutes before the Museum opens for the day, basks in its own warmth and atmosphere of banners blazing—the Capital Campaign banners at the north, the Donors' banner at the south—creating an exciting, yet restful, and always promising, ambience that will greet visitors throughout the day. For more on the Capital Campaign see page 7. Photo by D. Walsten.

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Events

¡Celebracion!

Weekends in May

Come hear the sounds of Mexico—from the lively rhythms of mariachi music to the centuries-old sounds of an ancient Aztec dance ceremony. Experience the colorful ballet folkloric, a Mexican form of folk dance. Artists demonstrate sculpture, wood cut, and weaving. Watch a clever but funny puppet show and find out how the puppeteer brings his puppets to life. All events are free with Museum admission.

Saturday and Sunday
May 2 and 3
12:00noon-2:00pm

Flores de Papèl

Sra. Maria Louisa Almonte

Brilliant handmade paper flowers enhance the lights, colors, sounds, smells, and fireworks of a fiesta. Sra. Almonte demonstrates this traditional folk art of Mexico.

Fiber and Fabric of Mexico

North Shore Weavers' Guild

The brightest and boldest woven designs of ancient Mexico are reproduced today by the North Shore Weavers' Guild on a traditional Mexican loom.

Woodcuts

René Arceo

The expressive prints of René Arceo begin as pictures carved in wood. Experiment with woodcarving tools while the artist demonstrates the process of woodcut printing.

2:00pm

Mexican Folkloric Dance Company of Chicago

A special program of music and dance features the colorful ballet folkloric of Mexico. Performance pieces by this 50-member company include the mask dances "Los Moros" and "Los Viejitos," as well as "Chinelos" and "Parachicos."

S. Hernandez

Continued →

Events

¡Celebracion!

Weekends in May

Saturday and Sunday
May 9 and 10
12:00noon-2:00pm

Marionettes, Hand, Rod, and Shadow Puppets
Michael Montenegro

Practice your skill as a puppeteer as Michael Montenegro of Zapato Puppet Theatre works his particular type of magic, creating marionette, hand, rod, and shadow puppets.

Fiber and Fabric of Mexico
North Shore Weavers' Guild

2:00pm

Zapato Puppet Theatre
"The Rickity Wheel Makes the Most Noise"

Portrayed by marionettes, enormous masks, and more, the characters in this puppet performance range from the amusing Saldania, a Chilean storyteller, and his dog, Hueso, to La Llorona, the mythical crying woman of Hispanic folklore.

Saturday and Sunday
May 16 and 17
12:00noon-2:00pm

Clay, Stone, and Wood
Roman Villarreal

Sculptor Roman Villarreal brings life to clay, wood, and stone. As Roman works on a new clay sculpture, examine the tools he uses to transform raw materials into sculptures that beautify our city.

Fiber and Fabric of Mexico
North Shore Weavers' Guild

2:00pm

Quetzalcoatl Esplendor Azteca

Wearing magnificent feather headdresses and intricately beaded costumes, Quetzalcoatl Esplendor Azteca performs the ancient Indian dances of the Mayas, Chichimecha, Aztec, and Xochipitzahua. Visually exciting and laden with mystery, these dances portray deities, the sun, the moon, the four corners of the earth, life, death, and one's place in the cosmos.

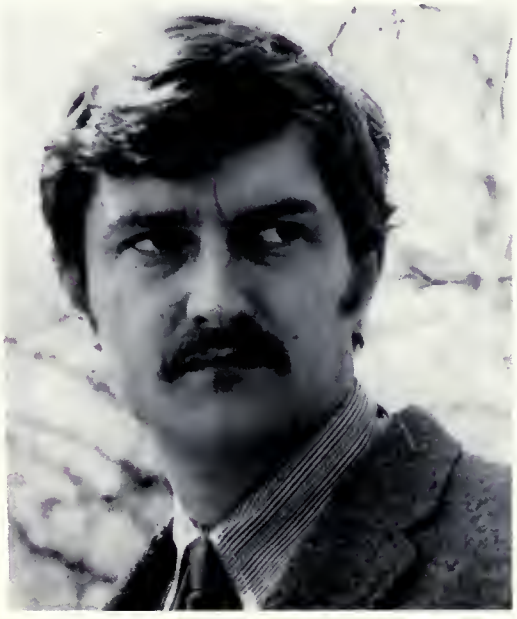
Demonstrations by North Shore Weavers' Guild first 3 weekends in May

Events

World Music Program

Weekends in May
1:00pm and 3:00pm

Join us for the World Music Program in May and enjoy folk music from South America. Experience the rich sounds of Raices del Ande and Peru Folkloric through live musical demonstrations and informal discussions. The World Music Program is supported by CityArts III and IV. For further information, call (312) 322-8854.



Peter Nabokov leads May 30 seminar

Adult Classes

SPRING ADULT CLASSES continue through May with lots of opportunities for weekend learning. One day, weekend classes include a special look at coffee complete with taste testing, a unique photography workshop geared towards the collector, and a class for adults looking for ways to better share the Museum with the children in their lives. Evening classes include a fascinating study of the domestic cat and the natural history of our Northwest National Parks. Consult the April/May class brochure for details.

Feature Seminar

Cosmology and Architecture in Indian America

Peter Nabokov, Fellow, Newberry Library

A BROAD RANGE OF INDIAN CULTURES across America are covered. Focusing on how architecture reflects understandings and relationships with the supernatural world, see how traditional philosophies speak of the sacred and inseparable bond between people and the land. Saturday, May 30; 10:00 am-4:30 pm; $50 ($40 members).

May Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the ***Weekend Programs*** sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

May

9 11:30am *"Ancient Egypt"* (tour). Explore the traditions of ancient Egypt from everyday life to myths and mummies.

9 1:00pm *"Flowers and Food Plants from Latin America"* (tour). In a brief tour, see some exotic and amazing flowering plants that are at home in Central and South America.

10 1:00pm *"Flowers and Food Plants from Latin America"* (tour).

23 2:00pm *"Flowers and Food Plants from Latin America"* (tour).

William H. Mitchell
1895–1987

The death of William H. Mitchell on March 21 marked the close of a 59-year record of service to Field Museum. Mr. Mitchell joined the Field Museum Board of Trustees in 1928. He served actively until 1980, when he was elected a Life Trustee.

Mr. Mitchell attended Harvard University, then served as a U.S. Navy aviator during World War I as a member of the Navy's first stunt flying team, the "Blue Devils." After a short period in the banking business, he co-founded the investment banking firm, Mitchell Hutchins & Co. The firm became one of Chicago's leading investment houses until it was acquired by Paine Webber in 1977. He remained as the firm's chairman until 1964 and as honorary chairman thereafter. He also was a director of Texaco, Inc., the Continental Illinois National Bank and Trust Co. and, in the nonprofit sector, a trustee of Northwestern University and of Northwestern Memorial Hospital.

Mr. Mitchell's 59-year service as trustee and life trustee of Field Museum was the longest in the Museum's history. His father, John J. Mitchell, was one of the founders of the Museum in 1893, continuing his tie with the institution as a trustee until his death in 1927. This extraordinary 94-year father-son tenure from the Museum's founding until 1987 is unequalled in Field Museum's history and may well be unique among Chicago institutions. During William Mitchell's years as a Trustee he served in many capacities—as a member of the Building, Investment, Resource Planning, and Executive committees. He was a generous donor over many years, in recognition of which he and Mrs. Mitchell were elected benefactors in 1974.

Bill Mitchell was a warm and engaging person. He enjoyed a good story and always enjoyed telling of his early years as a trustee in comparison to the somewhat more demanding pace of later years. Although remaining a resident of Lake Forest, he and Mrs. Mitchell had spent much of their time in Santa Barbara, California, in consideration of his health. Sandy Boyd, Field Museum's president, visited them once or twice a year and always reported Mr. Mitchell's continued and active interest in the Museum and its progress.

William H. Mitchell's death breaks a family continuum that takes us back to the years of Marshall Field I, Edward E. Ayer, Stanley Field, and the other early builders of Field Museum. It is a legacy that all Chicagoans may cherish and recall as they look forward to the Museum's centennial in 1993. One of the greatest testimonials to the leadership of Bill Mitchell, his father John J. Mitchell, and their colleagues through the years, is the calibre of those outstanding and talented persons now continuing to build an even greater Field Museum on the foundation bequeathed to them.

—E. Leland Webber, Field Museum President Emeritus.

Ron Testa

Like the "horse of a different color," the purple horse in The Wizard of Oz, *the campaign mascot "Denny Dinomometer" never fails to attract attention of visitors. The extent to which Denny is covered indicates the progress of "Time Future from Time Past." When completely purple, Denny will proclaim that 100 percent of the $40-million goal has been met. Here, visitors check out the progress of the campaign.*

Capital Campaign Update

The Kresge Foundation Issues Field Museum a $1.5 Million Campaign Challenge

Marathon runners say the hardest leg of any race is the last leg. The same could be said of an ambitious undertaking such as the Museum's Capital Campaign, "Time Future from Time Past." The real test is still to come: Field Museum must raise the final ten percent of its goal.

The Kresge Foundation has formally challenged Field Museum members to achieve what would be a

new Museum fund-raising record—full funding for the $40 million Campaign. The challenge comes in the form of a challenge grant, which stipulates that when the Museum meets its goal, the Foundation will give the Museum $1.5 million to make the Campaign a 100+ percent success. The grant, one of the largest to be given by the Kresge Foundation this year, is earmarked for building restoration.

"The Kresge Foundation grant is an incentive, a challenge and a vote of confidence in the Museum and its members all in one," says Campaign Chairman Richard M. Jones. "We fully expect it to spark enough additional support to make this Campaign the most successful fund-raising effort ever launched by Field Museum.

"With the target date for the Campaign's windup just around the corner, the timing of the challenge grant is perfect," says Thomas R. Sanders, vice president of Development. "It gives our members a wonderful opportunity to maximize the impact of their gifts before the Campaign's end."

"Denny Dinomometer" Registers $36 Million

Currently the most important "dinosaur" in Field Museum's collection, "Denny Dinomometer" is a nine-by-twelve-foot replica of a tyrannosaur that tracks the progress of the Capital Campaign. Denny is now 90 percent purple, indicating that the Campaign has reached the $36 million mark. When Denny is purple from head to tail, the Campaign will have met its $40 million goal.

William Burlingham

Visitors Rachael Burlingham (left) and Grace Air add their names to history at the Banner Booth in Stanley Field Hall. More than 1,000 names quickly filled one banner, and this second one is in process of being completed.

An outgrowth of a long-range plan designed to prepare Field Museum for its centennial, the Capital Campaign seeks philanthropic support to preserve its structure . . . to add interesting and informative new public exhibits and programs for the people of Chicago and beyond . . . and to maintain its international reputation as a center of scholarly research.

Telemarketing Proves a Capital Idea for Museum

The key to meeting the Kresge Challenge—and putting the Campaign over the top—is full member

There's Never Been A Better Time to Contribute

If you have not yet made your gift to the Campaign, the time to contribute is now. That's because your gift will increase in value as a result of the Kresge Foundation challenge grant, the payment of which is contingent upon a 100 percent success rate for the $40 million Campaign. The Kresge Challenge offers you an opportunity to maximize the impact of your gift, and to participate in the most important fund-raising effort in Field Museum's history. To make a gift to the Campaign, please call Tom Sanders at 322-8857.

William Burlingham

Three of the many volunteers who have spearheaded the Capital Campaign are, left to right, Richard M. Jones, chairman of the Board of Trustees and Capital Campaign chairman; William L. Searle, trustee, Leadership Division chairman of the Campaign, who led the way with a $2.5-million gift through the Searle Family Trust; and James J. O'Connor, trustee, and immediate past chairman of the Board.

participation in the Campaign. That is the aim of the Museum's Capital-By-Phone program. Running concurrent with personal solicitations by volunteers, this telemarketing effort, the Museum's first, has brought the news of the Campaign to an unprecedented number of members.

Museum representatives working on behalf of Capital-By-Phone have contacted over 40 percent of all Museum members, raising over one-half million dollars toward the Campaign's $40 million goal. The Museum hopes to reach the remaining members before the end of the phone campaign.

"The concept behind the phone campaign is quite simple," says Museum President Willard L. (Sandy) Boyd. "Our members are our strongest supporters, and we want to give *all* of them the opportunity to give, not only those we have been able to visit personally. The Campaign is at a critical point, and we need the involvement of our members to reach our goal."

Members Invest Themselves in Campaign

Indeed, the Campaign's tremendous progress is due in large part to the loyalty of the Museum's members—

Anthony C. Pascente, Western Waterproofing Co., Inc.

Preservation of the Museum's classic structure is one of the Capital Campaign's primary goals. Here, workers remove balustrades and panels from the top of the Museum, lowering them by crane to the ground for cleaning and repair.

young and old. The Campaign banners, which hang in Stanley Field Hall, serve as colorful symbols of the Campaign's broad base of support (see cover). More than 2,000 visitors have decorated the banners with their autographs, designs, and personal "logos" for a contribution of $5 or more to the Campaign. Children are among the most frequent signers, with drawings of dinosaurs, rainbows, and hearts taking the lead as the most popular form of signature.

"While the exciting progress toward our Campaign goal captures the spirit of growth at the Museum, it doesn't begin to convey the full impact of the Campaign," says Tom Sanders. "Nor does it adequately reflect the personal commitment of the many members who have worked to make this Campaign a success."

Sandy Boyd agrees: "Like other Field Museum activities, the real vitality of this Campaign is a direct result of the individual and collective efforts of our members. They are our alumni—investing their time, energy, talents, and support in the Museum year after year. Field Museum is indebted to them."

Campaign Shapes Field Museum of Future

While the restoration of the Museum's landmark home may be the most visible sign of the Campaign's impact, it is only one area where Campaign funds are already making an important difference.

For example, the Museum will have a new face inside as well as out as a result of the renewal of numerous public exhibits and programs:

* Through the generosity of Juli and David Grainger, the Museum has transformed the Gem Hall into a showcase that rivals the beauty of the gems it displays.
* The Webber Resource Center, the first of several such centers for in-depth exploration of Museum collections, will open this summer.
* "Size," an informal exhibit devoted to issues of size and scale, will open next fall thanks to a generous grant from the Oscar G. and Elsa S. Mayer Charitable Trust.
* 1988 will witness the opening of "Rearing Young," a special exhibit and visitors center funded by the Elizabeth Ferguson Trust.

According to Michael Spock, vice president of Public Programs, these exhibits offer only a hint of the new educational efforts being planned by the Museum as a result of the campaign.

Behind the scenes, Museum research scientists are pursuing important new lines of inquiry with the help of new endowed funds, like the Elliot Donnelley Family Research Fund. For example, Museum scientists were recently able to make a last-minute trip into the Brazilian Amazon to inventory a forest before it was destroyed in order to make way for commercial development. The trip yielded an important discovery: scientists uncovered a rare pocket of high-diversity bird life.

Anthony C. Pascente, Western Waterproofing Co., Inc.

Workmen pour foundation for new south steps, using a steel frame made especially for the project.

In addition to providing seed money for research expeditions, the Campaign will also make a critical difference to the training and development of future scientists. The Lester Armour Family Graduate Fellowship Program will enable the Museum to support the work of young scientists, today and in the future, for whom the collections will form the basis of research. A Visiting Scholars Fund established by the Prince Charitable Trusts, will enable more scientists and scholars from around the world to come to Chicago to study and offer fresh interpretations of the Museum's collections. The result of these endowment funds and other sources of philanthropic support: The Museum will be able to fulfill its obligation to future generations to advance and preserve the knowledge of natural history.

"A masterfully restored home... informative new exhibits that bring our visitors closer than ever to the mysteries of nature... research that may uncover the answers to tomorrow's greatest medical or environmental challenges... and ongoing operating support from our generous members," says Sandy Boyd. "Thanks to the tremendous response to our Capital Campaign, Field Museum is going to be at the forefront of the world's most important museums of natural history. FM

Scaffolding on the east wall as renovation proceeds.

Somme Woods Prairie and Savanna, seen here in the lushness of summer growth, is the largest of the areas being managed and restored by the North Branch Prairie Project.

The North Branch PRAIRIES

by JERRY SULLIVAN
Photography by Steve Packard

On the North Branch prairies, the work starts promptly at nine on Sunday mornings. We work through the spring and fall—certain frost-proof zealots work even in the winter—in sunshine and rain, warmth and cold. "Dress appropriately for the weather" warns the printed work schedule that goes out to all the prairie volunteers. Our only concession to the elements is to call off winter work days when the windchill falls below zero. Building an ecosystem is not a job for the faint-hearted or thin-blooded.

Of course, the work is usually of a nature to keep you warm whatever the wind chill. Felling a small tree with a handsaw or cutting down a buckthorn thicket with a lopping shears will put color in your cheeks and sweat on your brow during the coldest and dampest days.

But somehow the work doesn't seem hard when you're doing it. This is partly because you are surrounded by friendly and convivial fellow workers, and it's partly because if you spend most of your life sitting in a chair shuffling papers or beating on a keyboard, manning a lopping shears for a day is more therapeutic than arduous.

And if your back does start to ache from too much stoop labor, you can draw comfort from thinking about

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Chicago writer Jerry Sullivan writes frequently on natural history for the Bulletin. *He does a column, "Field and Street," for the* Chicago Reader *and has done features on birds for* Audubon *magazine and other national publications. He was also editor of* Chicago Area Birds, *published in 1985 by Chicago Review Press.*

Volunteer worker Judith Kiriazis examines spike of blazing star.

where all this hacking and hewing is leading: to the re-creation of the sublimely beautiful native landscape of northern Illinois.

Some of you are probably thinking that last sentence must be a misprint. "Sublimely beautiful" is the sort of phrase you might use to describe, say, Big Sur, or Rocky Mountain National Park, or the Grand Canyon, but Illinois is about as sublime as a pool table. Other places have scenery; we have corn.

But the beauty of natural Illinois, pre-settlement Illinois, was less in the shape of the land than in the things that grew on it. Our native prairies and savannas held an assortment of plants and animals whose precise configuration was unique. A deadly combination of historical and ecological forces destroyed almost all of them, destroyed them so thoroughly that for a time they vanished from the historical memory of Illinoians, destroyed them so thoroughly that our ideas about what things were like 200 years ago must always contain an element of surmise.

Our work along the North Branch of the Chicago River, the goal of all those rainy Sundays, is to rebuild as nearly as we can the ecosystem that existed there when the Potawatomis were evicted from the state. The North Branch Prairie Project, to give the organization its formal title, has been on the job for ten years, reshaping the plant communities at seven separate sites on Cook County Forest Preserve land from the Sauganash Prairie at Bryn Mawr and Kostner avenues in Chicago to Somme Woods Prairie at Dundee and Waukegan roads in Northbrook.

Our work has already made some major changes in the way things look. Fields that used to be weed patches with a few prairie plants are now weedy prairies, and that is a major, and hard-won, advance. The work days are actually fun—lunch is particularly festive—and we have picnics and potluck dinners besides. We have had at least one marriage of prairie people, and the times being what they are, a couple of divorces.

Lately we have expanded into the creation of prairie gardens, not for decoration, but to supply us with seeds. We have a large garden at North Park Village Nature Center at Peterson and Pulaski in Chicago, and a couple of dozen volunteers are growing prairie species in their back yards, so far with mixed results. We collected the seeds for these gardens from unprotected prairie remnants within 15 miles of our North Branch prairies. By staying close to home, we hope to keep our ecotypes consistent. We will sow seeds collected in these gardens into our prairie reconstructions.

The tall-grass prairies of Illinois amazed the first set-

tlers with their beauty. Open, sunny, breezy, they were quite a change from the shady woods of the east. The world opened up on the prairie, the sky expanded into an enormous dome over the verdant earth. The wind rippled the grasses as it sped over the ground. And the flowers bloomed in numberless profusion. Today, woodlands are bright with hepatica and trout lily and trillium for a few weeks in spring, but the show ends when the leaves emerge from the trees. The prairies bloom from last frost to first frost. Every month has its specialties, from the bird's-foot violets of spring to the orange prairie lilies of July, the golden prairie docks of August, and the pale asters of October.

About 300 species of plants are known to have grown on the Illinois prairies, and as many as 20 species of flowering plants could be found in a square yard of prairie sod. Grasses were the most common, with such species as big bluestem, little bluestem, and Indian grass acting as dominants in the community. The grasses might account for half — or more — of the individual plants on the prairie, but they represent only about 10 percent of the species. The remaining 90 percent were forbs, to give them their proper botanical designation. In ordinary language, we would call them wildflowers.

Coral hairstreak butterfly on butterfly weed. The larvae feed on developing fruit of wild plum and wild cherry.

"The tall-grass prairies of Illinois amazed the first settlers with their beauty. The world opened up on the prairie, the sky expanded into an enormous dome over the verdant earth. The wind rippled the grasses as it sped over the ground. And the flowers bloomed in numberless profusion." Such vistas have come close to total disappearance in Illinois, but a remarkable program, now in its tenth year, is doing much to bring them back.

Illinois also had its woodlands. They dominated the southern end of the state. In the northern and central sections, the woodlands were concentrated mainly in the relatively wet areas on the flood plains of rivers.

There was a third major community in primeval Illinois, a savanna community that people here in the northern part of the state called an "oak opening." In central and southern Illinois, the savannas were known as "barrens."

Savannas are intermediate in structure between an open prairie and a woodland. They have some trees, but the trees are too widely separated to shade all the ground beneath them. Defining the boundaries between woodlands, savannas, and prairies is necessarily a somewhat arbitrary endeavor. According to one common definition, if the trees shade less than 50 percent of the ground at noon in mid-summer, the place is a savanna. At the other end of the scale, some investigators have settled on a density of at least one tree per acre as the minimum for a savanna.

Bur oaks were the most common trees in our savannas, although white oaks and hickories also occurred in some numbers and swamp white oak grew on wet sites. Since the trees were widely spaced, they developed broad, spreading crowns, and the lowest and largest limbs often branched off the trunk quite near the ground.

When the pioneers began moving onto this land, the savannas were a prime attraction. The soils were as rich as the prairies; the trees provided wood for building and fuel, and cattle could graze on the grasses that grew

near the oaks. The open prairies went next.

The settlers' assault on the land was unremitting and multifaceted. They plowed it; they paved it; they overgrazed it; they sowed it—usually accidentally—with alien weeds, and—the *coup de grace*—they protected it from fire.

The tall-grass prairie and the oak savanna were fire-dependent ecosystems. Prairie plants are almost all perennials. Their root systems live for many years. Each spring, they send up new green shoots to flower, set seed, and die. From fall until spring, the prairie is clothed in the russets, browns, and golds of these dead plants. It is a beautiful display, and incidentally, quite flammable. Before settlement, fires, natural or man-made, could sweep across the state, feeding on all these plant remains. The fires cleared the ground for the new year's growth and also incinerated any cottonwood seedling temerarious enough to try to invade the grasslands.

Small white lady's slipper

The savannas usually grew in places that were somewhat protected from fires. Given a few wet years with no flames, the oaks could climb above the surrounding grasses. Bur oaks have very thick and fire-resistant bark, so they could survive all but the hottest blazes once they gained a little height. The roots of bur oaks could also survive a fire, just as the roots of prairie grasses did, and send up new shoots the next spring.

Assaulted from every direction at once, the savannas had practically ceased to exist by the time of the Civil War. They became cornfields or pastures where grazing animals destroyed the plants of the understory, or if they were left alone but protected from fire, they became closed-canopy woodlands. They survive today only as place names: Long Grove, Elk Grove, Downer's Grove, or as individual trees, the gnarled old oaks that decorate parks and front yards all over northeastern Illinois.

The prairies did little better. The few remnants that survive escaped the general destruction purely by accident, and until quite recently, almost no one knew what these survivors were or where they were. Around the time of World War I, when some enlightened souls decided to set up a system of natural parks for the benefit of Chicagoans, they called it the Cook County *Forest* Preserve system and set about buying woodlands. They totally ignored the open areas they called meadows.

The land they bought along the North Branch of the Chicago was a mixture of woods, old fields, and former cow pastures. Much of it was covered with alien plants like the pestiferous shrub called European buckthorn. The open fields were mostly depauperate places filled with weedy herbs and grasses.

But somehow, a few forlorn bits of natural Illinois had managed to hang on along the North Branch, and in the summer of 1975, Steve Packard discovered them. Packard is now a field representative for the Illinois Nature Conservancy, but at that time, he was new to field botany. His major interest in the North Branch forest preserves was the bicycle trail where he rode for relaxation in the evening.

He made his first discovery on June 22 of that year, when he noticed some unusual flowers blooming near the trail. With some help from Roger Tory Peterson's wildflower guide and Robert Betz's book *Prairie Plants of the Chicago Region,* he identified them as ragged fringed orchids, native plants, and rather special ones.

Other discoveries followed until he had identified all seven of the areas currently being managed and restored by the North Branch Prairie Project.

Sauganash Prairie, the southernmost site, is wet prairie and what appears to be a wet savanna, a community so rare that no one has been able to find one to study.

Bunker Hill Prairie at Caldwell and Devon avenues, is a diverse area supporting, among other notable species, a population of mountain blue-eyed grass, endangered in Illinois and known from only two sites here.

Miami Woods and **Indigo Prairies** lie between Oakton and Dempster streets in Morton Grove. Miami Woods is the other site known for mountain blue-eyed grass. Large old bur oaks and northern pin oaks remain to mark the location of an old savanna.

Wayside Prairie is just north of Dempster Street. Northern dropseed grass grows there along with such species as purple prairie clover.

The **Milwaukee Road Prairie** is a tiny but rich remnant along the Milwaukee Road railroad tracks just east of Wayside Woods. Its assortment of prairie species includes such rarities as Leiberg's panic grass, prairie coreopsis, shooting-star, and prairie betony.

Smooth phlox (pink) and hoary puccoon

Somme Woods Prairie and Savanna is the northernmost site and the largest. Its botanical attractions include cream gentian and the endangered small sundrops.

Having discovered these sites, Packard decided to try to do something to preserve and restore them. He went first to Cook County Forest Preserve headquarters

in search of permission to sow the seeds of additional prairie species onto his remnants. Then, drawing on his experiences in the anti-war movement, he set about developing a constituency for his prairies. He contacted groups as diverse as the Sierra Club and the Sauganash Garden Club and led them on tours of the North Branch prairies. Next he got volunteers from these groups to come out and help him gather and sow seeds and clean up trash, moves that helped the prairies and also created a group of people who had gotten their hands dirty and their feet wet working on the land.

The Forest Preserve District had agreed not to mow these sensitive areas, but somehow the word didn't get down the chain of command, and one morning Packard arrived at Miami Woods Prairie and found the whole place had been mowed.

"I looked at it," he recalls, "and I knew we had made it." He started to call all the people who had taken a tour of the prairies, and they began to call and write to the Forest Preserve District, asking them to stop the mowing. In response to all this attention, the Forest Preserve District decided to take a longer look at the North Branch prairies.

Roland Eisenbeis, the superintendent of conservation, and Sam Gabriel, the chief forester, toured the sites along with Packard and Dr. Robert Betz of Northeastern Illinois University, the reigning local expert on prairies, and the man whose book had helped Packard discover these remnants. Betz looked them over, made allowances for all the weeds, and declared that these places were excellent examples of "incipient prairies."

So the FPD issued permits allowing the North Branch Prairie Project to gather and sow seeds and to use hand tools to clear brush and trees from places that ought to be prairie.

Packard organized the first work day on August 6, 1977, with a 13-person crew he picked up at a Sierra Club membership meeting. Since then nearly 600 volunteers have taken part in work days, gardening, and other project tasks, donating over 15,000 hours of labor to the job. We have had some ups and downs, some disappointments and some pleasant surprises. The cumulative effects of all this work are beginning to make a real difference in the look of the land along the North Branch. Fields that used to be weed patches with a few prairie plants hanging on in them are now prairies with a few weeds. Prairie grasses grow now where buckthorn

Cutting brush from grade A prairie (fire does it better).

thickets used to cast a shade so dense that nothing could survive under it. Stately old oaks that were once hidden by the scruffy second-growth woods surrounding them are in the open now. And for the past three years, we have been working on the most ambitious savanna restoration ever attempted.

The volunteers have accumulated a vast amount of communal knowledge, although most of it exists mainly as oral tradition. Nobody has had a chance to write it down yet. The thing we have learned above all is to have patience.

On that very first work day in 1977, Steve's 13 volunteers spent a day gathering about 2,000 seeds of the smooth phlox from an unprotected prairie site. On the next work day, the same 13 volunteers planted those seeds in Bunker Hill Prairie. It was the last they saw of the phlox for four years. "If you are looking for instant gratification," Steve told me, "this is not the job for you."

The disappearing phlox were just lying low. Domestic plants are bred and planted to produce seeds that germinate all at once; wild plants hedge their bets. Germination is all or nothing. A seedling can't poke its cotyledons above ground for a look around and then crawl back in the seed coat if the rains stop.

So the phlox seeds waited for the right moment. Some came up the first year, and some the second, and so on. For the first couple of years, they hid near ground, each plant a few tiny leaves and a two-inch stem. Prairie plants are conservative. They invest most of their energy in roots. A one-year-old plant may be two inches tall and have roots that reach down two feet. After four years, some of the phlox had a base solid enough to let them produce flowers. Now they bloom every year, in considerable numbers. You can see them in June. That kind of story can be told about most of the 200 or so species of prairie and savanna plants the North Branch Prairie Project has sown into its plots. After 10 years, those slow growers are starting to show up in numbers.

In the North Branch Phrase Book, the words "Somebody should . . . ," as in "Somebody should start growing these plants in his backyard," is always translated as "I volunteer," as in "I volunteer to grow these plants in my backyard."

Preston Spinks, a volunteer who lives in Morton Grove near Wayside Woods Prairie, spoke more or less those very words one day, and thus was born what might be called the North Branch captive breeding program. Spinks has a very green thumb. He has managed to coax dozens of species of prairie and savanna plants into germinating in flats in his backyard. His methods are suf-

Take an Inventory

Storekeepers take inventory so that supplies, equipment, and merchandise that is actually on hand can be compared to what should be on hand.

Homeowners take inventory when their insurance is to be increased.

Yet, persons with wills often forget to keep inventories current. When that happens, their families may be left with the same unnecessary problems that the persons who originally made wills intended to avoid.

Don't take chances with your will being out of balance with your family's needs and your assets. Schedule a meeting with your attorney to take an inventory of what you think your will contains and what it may now actually contain. An out-of-date will is often as ineffective as no will at all, so don't neglect one of the most important inventories you will ever make.

For suggestions on preparing or revising your will, mail the coupon below for the booklet "How to Make a Will that Works."

---------- clip and mail today ----------

To: Clifford Buzard
Planned Giving Office
Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, Illinois 60605-2496

☐ Please send me a complimentary copy of "How to Make a Will that Works," at no obligation.

Name _____
(please print)

Address _____

City _____ State _____ Zip _____

Phone: (home) _____ (office) _____

Best time to call: (day) _____ (hour) _____

Planting phlox seed in Wayside Prairie. Some of the prairies had been mowed "lawns," because nearby residents had complained that they looked messy. The Forest Preserve District was pleased to let them grow when volunteers offered to restore them to good health.

ficiently reliable to allow him to turn out hundreds of seedlings every spring. Volunteers plant these in the prairies using tools designed by the North Branch Prairie Project. Seedlings have a much better chance in life than seeds, and captive-bred wildflowers are now blooming all over the North Branch.

The captive breeding program is vital now because so many of the old seed sources are gone. The volunteers used to collect most of their seed from five unprotected prairies within 15 miles of the North Branch. All of those prairies have now been largely destroyed. Gardens will help to replace them.

The group tends its own garden at North Park Village Nature Center, and an expanding network of backyard gardeners is helping keep these gene pools alive.

The relationship between the NBPP and FPD has evolved in interesting ways. There was a certain mutual wariness at first, but that dissipated with the passage of time. The district has supported the project strongly. Those initial grants of permits were expanded in 1981 with a permit to burn the North Branch prairies. The burns are carried out by volunteer crews from the North Branch Prairie Project. The volunteers are bright, highly motivated, and—heading into the sixth year of burning—experienced. Steve Packard is proud of the fact that "we've never burned a foot of ground we didn't want to burn."

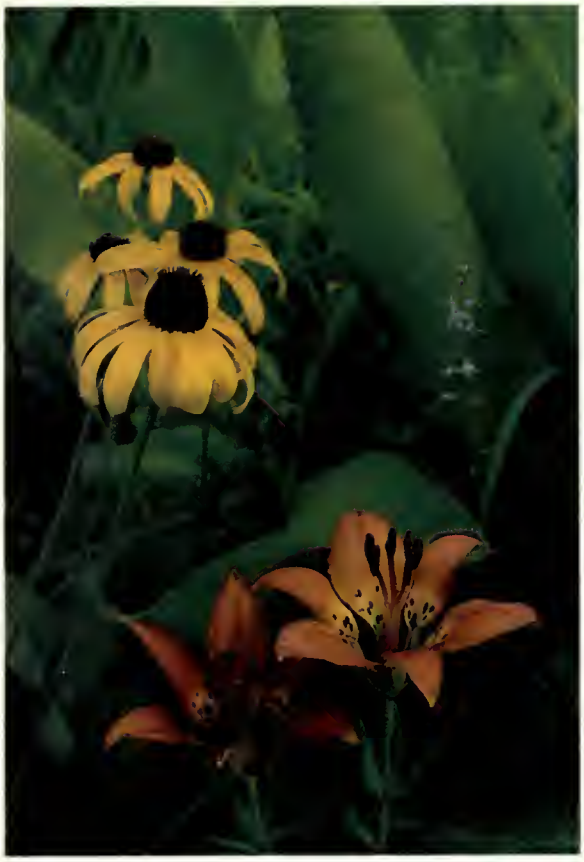
The District has also placed concrete posts at vulnerable places to keep off-road vehicles out of the prairies. The biggest contribution has been to let this group of volunteers manage 200 acres of Forest Preserve land in the interest of recreating a piece of natural Illinois. Bureaucrats aren't usually that bold.

The NBPP pays back this trust by being very discreet. Hand tools are part of that discretion—no loud motors in the woods. Making gradual changes in the land is another. "We spend years clearing places that you could

Chicago Area Wildlife Series

Reprints of recent articles on Chicago-area wildlife are available by writing the *Bulletin* editor, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2499. Titles available include: "Chicago's Parakeets," by David M. Walsten (May 1985); "Spring Wildflowers of the Chicago Area," by Floyd A. Swink (April 1986); "Owls of Chicago," by Jerry Sullivan (Feb. 1987), "Water Snakes that You Might See Around Chicago," by John C. Murphy (March 1987); and "Spring Bird Migration at the Foot of Lake Michigan," by Kenneth J. Brock (April 1987).

Prices: 1-5 copies: 75¢ ea. plus 75¢ shipping and handling; 6-10 copies: 70¢ ea. plus $1.25 shipping and handling; 11-25 copies: 65¢ ea., plus $1.50 for shipping and handling. Since supplies are limited, 25 copies is the maximum for a single order. Check or money order made payable to Field Museum.



Prairie lily (orange), black-eyed susan (yellow), and pale-spike lobelia (blue) shown with leaves of wild quinine and prairie dock.

Prairie white-fringed orchid, an endangered species. This plant grew from seed scattered in Somme Prairie, where there had been none. It took five years to bloom.

Raking seed after fire, Miami Woods. Most fires are set in early spring, before migratory birds return, before snakes, insects, and other creatures have emerged from hibernation, and before the growing season has begun for native prairie plants. A mix of more than 100 species of rare local plants, gathered the previous fall, is raked into the established turf. In the long run, these plants will easily out-compete the weeds.

clear in a weekend," Ross Sweeny, one of the project's leaders, once told me. "People get upset when they see falling trees."

The attempt is to avoid doing anything that could cause trouble for the District. They have enough problems operating a system this big in a county this crowded.

The big excitement on the North Branch these days is over savanna restoration. The natural savannas of our state vanished so quickly that almost nobody with any botanical knowledge ever had a chance to look at one. By the time serious botanical work started in the late 19th century, the savannas were either cow pastures or forests. The question of what grew there before settlement couldn't be conclusively answered.

Opinion leaned to the idea that savannas were essentially prairies with a few trees. Experience on the North Branch suggested that was not the case. Prairie plants grew quite well away from the trees in full sunlight. Back in the woods, plants like jack-in-the-pulpit returned on their own after fire and brush cutting removed the buckthorn. But there was a space of scattered trees and woodland edges, the sort of space whose mixture of light and shade would qualify it as a savanna, where almost nothing grew. The volunteers raked both prairie and woodland seeds into these sites, but they just wouldn't come up. A few plants appeared spontaneously, cream gentian was one—it is now common at Somme Woods—yellow pimpernel was another. And some rarities showed up, eared gerardia and small sundrops.

Using their presence as a starting point, Steve Packard tried to figure out what kinds of plants grew in the savannas. His information source was *Plants of the Chicago Region* by Floyd A. Swink and Gerould Wilhelm, published by Morton Arboretum. The book is an alphabetical listing of all the vascular plants known to grow in the Chicago area. Under each listing are remarks on habitat and lists of typical associates. Working outward from what grew in the North Branch savannas, he put together a hypothetical list of savanna species.

It would have stayed hypothetical if Packard hadn't also discovered an article published in an 1846 issue of *The Prairie Farmer* magazine by a Dr. S. B. Mead of Hancock County, Illinois. Mead's article contains a list of the plants Mead found growing in the "barrens" in Hancock County. This is the only list we have of savanna species compiled by someone who actually saw a savanna. Doctors got around in the days of house calls by horse and buggy, and Mead must have done a lot of botanizing along the way. His list includes 106 species. Many of them are also on Steve Packard's list.

Starting in 1985, a savanna seed mix of about 100 species began to be planted in appropriate locations along the North Branch. It's coming up like crazy. FM

Music and Dance in Papua New Guinea

April 29 through July 12

Sixty-five brilliant color photographs by photographer Jordan Wright, showing traditions and changing lifestyles in Papua New Guinea, will be on display from April 29 through July 12.

The special exhibit, "Music and Dance in Papua New Guinea," combines photography, everyday objects, and tape-recorded traditional music to present one aspect of a little-known people.

The exhibit has been organized by the Smithsonian Institution Traveling Exhibition Service (SITES) in cooperation with the University Museum of Archaeology/Anthropology of the University of Pennsylvania. The show is derived from the more than 4,000 photographs taken by Jordan Wright during the spring and summer of 1982.

The highland people of Papua New Guinea were once divided into hostile tribes that spent much of their time in warfare and ritual preparation for warfare. Dances, elaborate costumes, and colorful body painting were part of this ritual. Today, however, these lavish displays are part of friendly competitions, and serve to preserve cultural behavior.

The photographs in "Music and Dance in Papua New Guinea" convey the warmth and beauty of life today in the Highland Sepik villages of New Guinea. Highlights include exclusive photographs of the Sepik "welcome dance" and a series of photographs telling the story of a marriage.

Jordan Wright's pictures also show the festive events at the annual Mt. Hagen/Goroka Fair—an extravaganza of parading, dancing and singing. The elaborate music and dance competitions shown give evidence of a traditional life that has only recently been touched by contact with the 20th century.

36th Annual Members' Night

Friday, May 15, 5:00 -10:00 P.M.

A natural history museum's great value, aside from standing as a wonderful warehouse of treasures, is to inspire our imagination and to arouse our curiosity in our environment.

A museum helps us explain scientific discoveries that once seemed beyond our understanding and it inspires our awe at the wonders of our everyday world.

Join us on Members' Night at Field Museum and visit with our curators, researchers, and entire Museum staff and find out why their work is so important to you and to the world.

There will be special exhibits, activities and entertainment all evening, including Filipino dancing by the Lakambini Performing Arts group; singing and dancing by the Varblomman Swedish Children's Club Vasa #45; and light classical and contemporary music by the Paganini Ensemble.

If you are coming by car, you may park free of charge in the Museum's north lot or Soldier Field lot. Simply show your Member card or invitation.

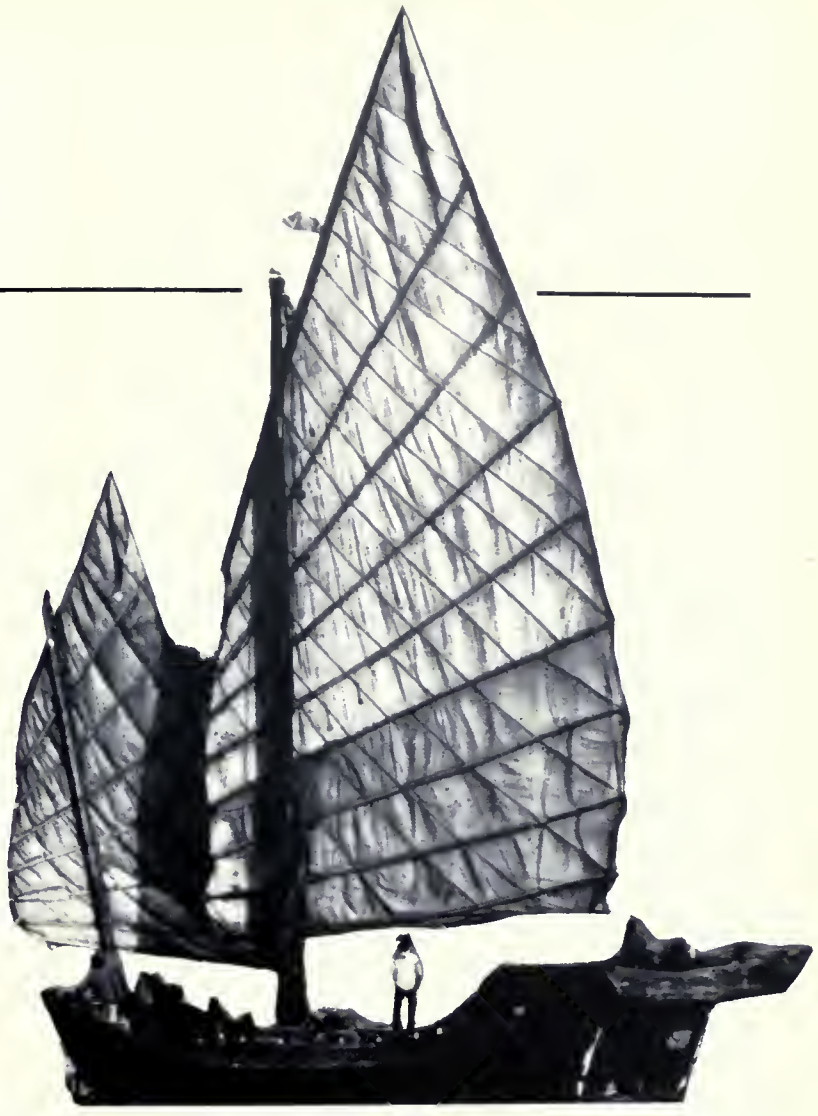
Free bus service will be operating between the Loop and our south door. These CTA buses, marked "*Field Museum*" will originate at the Canal Street entrance of Union Station (Canal at Jackson) and stop at the Canal Street entrance of Northwestern Station (Canal at Washington); Washington and State; Washington and Michigan; Adams and Michigan; Balbo and Michigan.

Buses will begin running at 4:45 P.M. and continue at approximately 20-minute intervals until the Museum closes at 10:00 P.M. You may board the free "*Field Museum*" CTA bus by showing your Member card or invitation.

Members are invited to bring family and up to four guests at no additional charge. Special arrangements for handicapped persons can be made by calling 922-9410 extension 453, beginning May 4. "Behind-the-Scenes" activities will end at 9:00 P.M.

FIELD MUSEUM TOURS

An Extraordinary Exploration of CHINA



© Marcello Bertinetti/Photo Researchers Inc

September 12 to October 2
$4,345 per person
Leader: Katherine Lee

September 12: Departure from Chicago O'Hare at 12:00 noon via Japan Air Lines 747 (flt. #9). We'll fly non-stop to Tokyo. JAL's gracious inflight service will help the time pass quickly, and you'll hardly notice that we lose a day crossing the International Date Line.

September 13: Arrive in Tokyo at 2:40 pm. After clearing customs, you will be met and assisted in the transfer to the Nikko Narita Hotel, near the airport. Your evening should be leisurely, and after a good night's sleep you'll be ready the next morning to go on to Shanghai and the delights of China.

September 14: Depart Narita International Airport (Tokyo) at 9:00 a.m. en route non-stop to Shanghai, arriving about 1:00 pm. You will be met by China International Travel Service guides and transferred to your hotel, the Hua Ting Sheraton. The remainder of the day is at leisure. Tonight you will enjoy dinner at your hotel.

September 15: Today visit points of interest in Shanghai, including the carpet factory, jade factory, and the Jade Buddha Temple, in the western part of the city. Lunch at the hotel. This afternoon you will visit the Shanghai Museum, one of the richest in the country and outstanding for its bronzes and paintings. Many of you will remember "The Great Bronze Age of China" exhibition at Field Museum in 1980 which featured Shanghai Museum artifacts. Dinner will be enjoyed at a local restaurant. This evening we will attend a performance of Chinese acrobats or folk opera.

September 16: We will transfer to the station for our train ride to Suzhou. After checking into our hotel, we will have lunch there. Because of its extensive network of canals, Suzhou has been called "The Venice of the East." Suzhou is especially renowned for the quality of its embroidery. This afternoon we will visit the Silk Institute and factory. Dinner at the hotel.

September 17: The remainder of the morning is free for browsing through shops and bazaars. Lunch will be at the hotel too, and in the afternoon we will visit the famed gardens of Suzhou. Dinner at the hotel.

September 18: Today we'll leave Suzhou. We'll enjoy a cruise on the Grand Canal to one of China's magnificent silk cities—Wuxi. In Wuxi, we'll be met by our guide and transferred to the hotel. Coming into Wuxi is like stepping into a traditional Chinese water painting, showing water scenery and mountains. The main attraction of Wuxi is Lake Taihu, China's fourth largest freshwater lake. Lunch at the Lake; dinner at the hotel.

FIELD MUSEUM TOURS

September 19: This morning we will visit the pottery factory. We'll return to Shanghai by train, then continue on to Beijing by air. Lunch will be planned too. Upon arrival in Beijing, we'll be met by our guide and transferred to the Jing Lun Hotel. We'll have dinner at a local restaurant in Beijing.

September 20: Our morning tour will include visits to the Forbidden City (Old Imperial Palace), Tien An Men Square, the Temple of Heaven, and other points of interest. Again we have an opportunity to enjoy lunch in a local restaurant. This afternoon, visit the Summer Palace with its famous marble boat and the Beijing Zoo with its popular panda bears. A special dinner, featuring a menu prepared for the Dowager Empress will be served to you at the Summer Palace, after which we will return to the hotel.

September 21: We will leave for our visit to the Great Wall of China and the nearby Ming Tombs, travelling by train and motorcoach. Lunch during tour—probably at the Badaling Station at the Great Wall. This evening we'll enjoy the now famous Peking duck dinner at a local restaurant.

September 22: We'll transfer to the station for our train ride to Luoyang. We'll be met in Louyang and have lunch en route to the hotel; dinner this evening will be at our hotel.

September 23: Although a quiet city today, during the Chou and Han dynasties Louyang was China's capital. It was also flourishing during the Sung Dynasty, when an impressive number of buddhas were carved in the caves at neighboring Longmen (A.D. 550-600). You will see one buddha 60 feet high, as well as a cave containing 10,000 small buddhas. Lunch at a local restaurant near the caves, return to the hotel for dinner.

September 24: We will depart to the train station. Upon arrival, we will transfer to the Golden Flower Hotel. Lunch will be scheduled at a convenient time, and we will have dinner at the hotel.

September 25: Xian is the principal center of ancient Chinese culture. We will have a full day visiting a good number of the important sites. Those of you who saw the exciting Chinese exhibit of the life-size warriors and horses at the Field Museum in 1983-84 must surely be anticipating your visit to this site. It is here where the pottery figures were unearthed from guarding the Emperor's tomb. Nearby are the scenic Huaging Pools, the Greater and Lesser Wild Goose Pagodas, the Forest of Steles (the oldest and best collection in China and a treasure house of ancient calligraphy, art classics, and stone engravings), and the Bell and Drum Towers. We will also visit the Banpo Museum, one of China's finest. We will lunch at a restaurant in Banpo village, and dinner at a local restaurant.

September 26: We will continue our sightseeing adventure in Xian. Lunch will be at one of the sites and we will return to the hotel for dinner.

September 27: Today we leave Xian. We will transfer to the airport for our flight to Guilin. Lunch will be scheduled later. The afternoon will be spent sightseeing, including the exotic limestone caverns, museum, and the city market. Dinner will be at the hotel.

September 28: You will enjoy another highlight of your trip to China! You'll have a full-day cruising on the beautiful Li River. You will observe cormorant fishing in addition to viewing the steep karst mountains which form the exotic terrain as seen in many famous Chinese paintings. A box lunch will be served en route; dinner at the hotel.

September 29: Today we leave the Peoples Republic of China. After breakfast, we will transfer to the airport for our flight to Hong Kong via a connection in Guangzhou. In Hong Kong, we will transfer to the Shangri-La Hotel.

September 30: This day is at leisure for pursuit of your own personal interests—relaxing or shopping. Optional tour programs are available at additional cost. Tonight we will enjoy a farewell banquet at the hotel.

October 1: Today we start home. We will transfer to Kai Tak International Airport and board our flight to Tokyo (JAL flight #64 leaves at 2:35 pm—arriving in Tokyo at 7:30 pm). Upon arrival we'll transfer to the Nikko Narita Hotel.

October 2: We'll transfer to the airport for our homeward flight on Japan Air Lines flight #10, which departs Tokyo at 12:00 noon and arrives at Chicago O'Hare at 9:30 a.m. the same day (we regain the day lost when we crossed the International Date Line). Welcome Home.

The price includes air fare and all meals while in China. Breakfast will be at your hotel each day.

Kenya Tanzania Safari

February 20 to March 10, 1988
$5,245 per person
Leader: Audry Faden

February 20: Your safari begins when you board your British Airways flight to London this evening.

February 21: Arrive London's Heathrow Airport this morning. You will be met and transferred to the Sheraton Skyline Hotel, where day-rooms will be provided until your British Airways flight to Nairobi this evening.

February 22: Upon arrival in Nairobi, you will be met and transferred to the luxurious Norfolk Hotel—a famous colonial landmark and one-time haunt of Teddy Roosevelt, Ernest Hemingway, and Robert Ruark. This afternoon, enjoy a half-day tour

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

of Nairobi, visiting the colorful African market, the unique Kenyatta Conference Center, Nairobi University, and the famed National Museum, known for its superb natural history collection and watercolors by Joy Adamson. Continue your tour by driving through the suburb of Karen, where you will see Isak Dinesen's original home, now a museum. This evening there is a welcome cocktail party and dinner at the Norfolk, with guests of the East African Wildlife Society.

February 23: Today you head toward the famed Tsavo West National Park, Kenya's largest national park. View game through the park before arriving at Kilaguni Lodge for lunch. From the lodge, watch the game come to the nearby waterhole. After lunch, go out in search of the great elephant herds. Your drive takes you to Mzima Springs, where large pools of clear spring water surface at the rate of 50 million gallons a day. Occasionally hippos can be viewed from the tank and cormorants swim by.

February 24: Today you drive to Amboseli National Park, justly famous for its big game and superb views of Kilimanjaro. The 150 square miles of park embody four main wildlife habitats including open plains, acacia woodland, scrub brush, and freshwater swamps. Spend the afternoon viewing animals such as wildebeest, zebra, giraffe, lion, cheetah, elephant, and rhino. Amboseli Serena Lodge.

February 25: Start the day with a dawn game drive in this beautiful park. Early morning is also the best time to view Kilimanjaro before the clouds build up over the summit. Game drive in the late afternoon—the best time to see lion and cheetah as they begin to stir from the shade.

February 26: Today you drive to Tanzania via the Namanga border, passing through minimal immigration formalities. Continue on to Gibbs Farm, a small, quaint farm in the midst of coffee plantations.

February 27: Today transfer to Ndutu Safari Lodge, situated on the shores of Lake Lgarya near the southeastern corner of Serengeti National Park. Here you will enjoy game-viewing drives both morning and afternoon.

February 28: Today you have game-viewing drives both morning and afternoon to explore the vast Serengeti plains. Here millions of wildebeest and zebra mill across the plains, seeking fresh grasses. You see large prides of lion, perhaps a leopard resting in a tree, groups of hyena, a mother cheetah teaching her cubs to hunt, giraffe, gazelle, topi, and kongoni—the list is endless. Ndutu Safari Lodge.

February 29: This morning you will drive into the Olduvai Gorge, the site of Dr. and Mrs. L. S. B. Leakey's famous discovery of the fossil he called *"Zinjanthropus boisei"* (now classified *Australopithecus boisei*). Here you will enjoy a visit to the small but very informative museum and a short talk by one of Mrs. Leakey's assistants, who will escort you to the site of the *"Zinj"* discovery. Continue on to one of the natural wonders of the world, the Ngorongoro Crater, a caldera created by the prehistoric collapse of a volcano cone. On the crater floor, herds of typical plains mammals live out their destinies: buffalo, zebra, wildebeest, Grant's Gazelle, Thomson's Gazelle, lion, and hyena. Ngorongoro Wildlife Lodge.

March 1: Today we spend down in the crater, tracking and photographing the animals. This great caldera contains some of Africa's finest black-maned lion. Rhino can be seen with calves, and waterbuck appear not to notice the visitors, enabling photographers to shoot at ease. On the lake in the middle of the crater, you can watch thousands of flamingos.

March 2: Descend into the crater once more early this morning for your last game drive here. Later depart to Lake Manyara Hotel, set on the edge of the Great Rift Valley and overlooking Lake Manyara National Park.

March 3: Enjoy a full day exploring the Lake Manyara National Park. This park contains five vegetation zones, thus supporting a large variety of fauna. Notable are the elephant herds and the tree-climbing lions.

March 4: Drive to the Namanga border where your Kenyan drivers will meet you for the drive back to Nairobi.

March 5: This morning you head northwest through undulating Kikuyu farming country, reaching the Aberdare Country Club in time for lunch. Transfer to special club vehicles for your game run to the Ark, which will take you into a deep forested area alive with some of the finest game viewing in Kenya. Driving along the animal trails and paths, you may suddenly come upon elephant, rhino, giant forest hog, Cape buffalo, waterbuck, bushbuck, warthog, colobus monkey, cerval cat, leopard, and perhaps the bongo antelope. The Ark is 'berthed' over a waterhole where the animals come to drink. From an underground dungeon you have an eye-to-eye view of this constantly changing scenario. Darkness descends, but floodlights permit game viewing well into the early morning hours!

March 6: Return to the Aberdare Country Club through the forest and clearings bright with clear morning light. Your safari driver will be at the club to greet you and you head north along the slopes of Mt. Kenya, then continue on, descending nearly 6,000 feet, passing through the town of Isiolo where your vehicle will suddenly be surrounded by smiling Kenyans holding out wares for you to buy, such as copper bracelets, necklaces, and bangles. Bargain away if you wish, it's expected. View game as you drive through Samburu Game Reserve to the lovely Samburu River Lodge, located on the Uaso Nyiro River.

March 7: Today you have both morning and afternoon game viewing of Samburu's typically 'northern' game—reticulated giraffe, Grevy's zebra, graceful long-necked gerenuk, Somali ostrich and vulturine guinea fowl, none of which you will see further south. Samburu is also a very good park for elephant and the elusive leopard. It is an excellent place for the photographer, with the park's vivid colors and the contrasts between sky, bush, and sand. Bird enthusiasts will be well rewarded with over 300 species, including the martial eagle, in this reserve.

March 8: Board minibus and drive to the famous Mount Kenya Safari Club. Here you have the remainder of the day to luxuriate at this private club made famous by the late William Holden. There is golf, tennis, heated swimming pool, horseback riding, two lovely shops, a beauty salon, sauna, and many attractive rooms set aside for drinking tea or something stronger. The view of Mount Kenya is awesome as are the finely manicured grounds.

March 9: Drive back to Nairobi where rooms will be provided at the Norfolk Hotel until your transfer to the airport for your flight to London.

March 10: Arrive London, where you will connect with your British Airways flight to Chicago arriving later the same day.

This tour will be operated by Abercrombie & Kent.

We still have space on the "Project Canadian Fjords" scheduled for August 16 to 24, aboard the *Society Explorer*. Please call for further information. Field Museum's leader is Dr. Scott M. Lanyon.

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
CHICAGO IL 60626

Members' Night

Friday, May 15

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

June 1987

Friday Evening Features in June

Films from Brazil

see pages 3-5

Field Museum of Natural History Bulletin

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COVER

"The Noblest Bequest of All," or "Our Share," cartoon, ca. 1910, by John T. McCutcheon (1870-1949), showing Field Museum not long after its name was changed from Field Columbian Museum. The cartoon depicts the original building, in Chicago's Jackson Park, occupied today (after radical reconstruction) by the Museum of Science and Industry. The Field Museum reopened at its present Grant Park location in 1921.

Arguably the greatest political cartoonist of this century, McCutcheon served on the *Chicago Tribune* staff from 1903 on. He won the Pulitzer Prize for cartoons in 1932 and, as this month's cover demonstrates, did not confine himself to subjects of a political nature. He was perhaps equally noted for his warmly sympathetic depictions of rural Midwestern life. His best known work, "Injun Summer" (1907), is republished every year around Halloween time in the *Chicago Tribune*. The original of "The Noblest Bequest of All" is in the Field Museum archives. 84776

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EVENTS

After Hours at the Field

Fridays in June
5:30pm, West Entrance

FREE

FIELD MUSEUM inaugurates a new program of films from around the world. Friday evenings in June feature films about Brazil. The series continues in July with films from Australia and New Zealand. Light refreshments are available for purchase before and after the films. Be sure to use the West Entrance to the Museum. For more information call (312) 322-8855.

Bye Bye Brazil

"One of the year's best films"—Roger Ebert and Gene Siskel, *Sneak Previews*.
"A rare treat...an earthy, exotic comedy...hums with vitality"—*Playboy*.

June 5
1980. 110 minutes. Color. Brazil. Director: Carlos Diegues. Portuguese with English subtitles.

This Carlos Diegues film blends the powerful *Cinema Novo* style with lively and colorful entertainment full of humor, sensuality, and realism. The story follows a shabby carnival group over 9,000 miles of lush Brazilian countryside, where they discover that modernization is quickly changing rural life styles and that past, present, and future must all now somehow coexist.

Continued →

E·V·E·N·T·S

*Hour of the Star

June 26
1986. 96 minutes. Color. Brazil. Director: Suzanna Amaral. Portuguese with English subtitles.

"I am a typist and a virgin, and I like Coca-Cola." So Suzanna Amaral's delicately naive anti-heroine describes herself in the beginning of this painfully honest film of a poor young girl who courageously tries to become a modern woman in the big city. *Hour of the Star* is this year's Brazilian nominee for the Oscar for Best Foreign Film.

E·V·E·N·T·S

Black Orpheus

June 12

1959. 98 minutes. Color. Brazil. Director: Marcel Camus. Portuguese with English subtitles.

This classic film retells the legend of Orpheus and Eurydice in modern Afro-Brazilian Rio de Janeiro. Orpheus, the handsome streetcar conductor, falls in love with the beautiful but troubled country girl, Eurydice, who is stalked by a mysterious masked killer. Winner of an Academy Award for Best Foreign Film for its electric and colorful rendering of Brazil's carnival.

*How Tasty Was My Little Frenchman

June 19

1971. 80 minutes. Color. Brazil. Director: Nelson Pereira dos Santos. In Tupi (a Brazilian language) and French with English subtitles.

A 16th-century Frenchman, captured by Tupi Indians, tries nobly to integrate himself into the Indian culture but discovers that true incorporation into the tribe is only possible in one way: through the stomach. This unusual film uses black comedy and vivid Brazilian scenery to make an allegorical point about Brazil's cultural development by Europeans. The cast is naked throughout as Periera dos Santos's aim is to show the innocence and sensuality of the Tupis while maintaining anthropological accuracy.

*Short ethnographic films of the Yanomamo Indians of Northwest Brazil and Venezuela proceed these films. Filmed by Timothy Asch with anthropologist Napoleon Chagnon.

June Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the *Weekend Programs* sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

June

7 2:00pm *Malvina Hoffman: Portraits in Bronze* (slide lecture). Examine the life and works of Malvina Hoffman, concentrating on the Portraits of Mankind Collection commissioned by Field Museum.

20 11:30am *Ancient Egypt* (tour). Explore the traditions of ancient Egypt from everyday life to myths and mummies.

STONE TIKIS of the MARQUESAS ISLANDS

by Jordan M. Wright

photos by the author

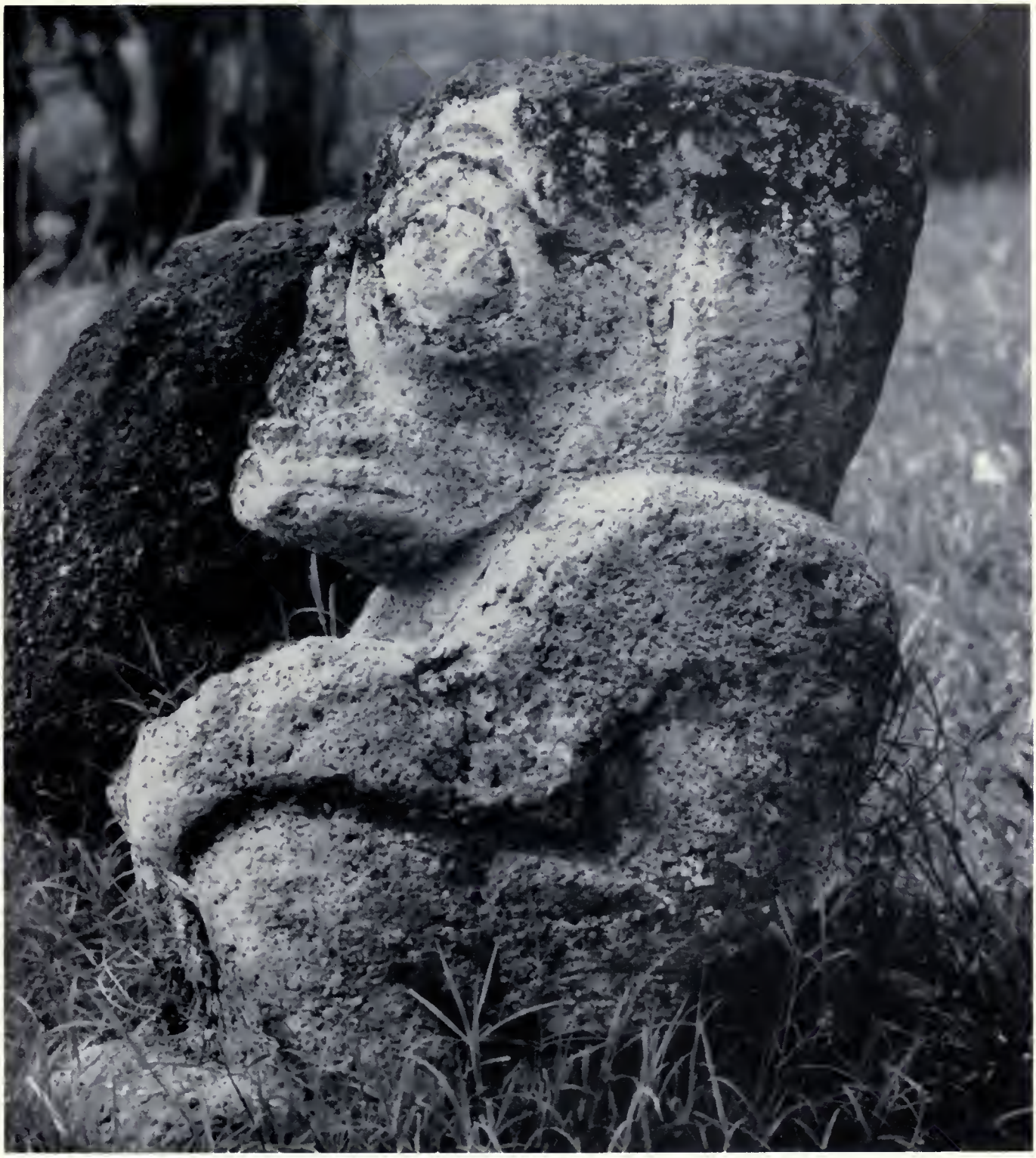
The Marquesas Islands comprise, together with the Society, Tuamotu/Gambier and Austral Islands, one of the five archipelagos of French Polynesia. This group is made up of six main islands (Nuku Hiva, Ua Pou, Ua Huka, Tahuata, Hiva Oa and Fatu Hiva) and a half dozen small ones situated to the north of Tahiti, about 1,000 miles. The total surface of the archipelago covers in all not more than 807 square miles. The islands are bound by dark cliffs that fall sharply into the sea. The principal valleys on each of the islands resemble great amphitheatres.

The Marquesas has been the name of these islands since 1595, when they were visited by the Spaniard, Alvaro Mendana de Neira, who baptized them in honor of the viceroy of Peru's wife, the marchioness of Mendoza, who had organized the expedition. They were more truly discovered 1600 years before by some canoe blown on a west wind from as far away as Samoa or Tonga. What they called the islands then is unknown, although not too long afterward the islands were referred to as Tettenua, Te Enata, the Land of Men.

From 1774 to 1791, Cook, Ingraham and Marchand visited the islands. Before missionaries converted the islanders to Christianity, the Marquesans fought many wars among themselves and were noted cannibals, but the diseases and vices introduced by the white man had a more devastating effect on the population than earlier practices. The Marquesas became a French protectorate

in 1842, after a treaty was signed between Admiral du Petit Thouars and the local chiefs. The population at one time was more than 100,000, but today is only 5,400.

The ancient Marquesans lived not in villages or in hamlets but in separate households located in the valleys or beside waterways. All houses were built on stone platforms, known as *paepae*. They are visible now among the coconut trees, often in ruins, symbols of how the Marquesans once were. The households in a valley would share a *tohou*, or public place, where the people danced and feasted. Their stone platforms were arranged around the tohou like grandstands, on which they built temporary shelters. In the remotest parts of the valley were the



me'ae (marae), where the holy men performed sacred rituals. Here they made offerings of pigs or breadfruit or their most sacred sacrifice, *heanna:* humans who had been caught to celebrate the death of a chief or the making of a god.

All of the constructions were made without mortar, but the stones destined for visible surfaces were often trimmed in a way which presented a more regular appearance. The sacred enclosures, surrounded by low rectangular walls, were generally paved. The great step platforms observed by Captain Cook and other voyagers seemed to have belonged to particularly important me'ea of late construction. In the enclosure of the me'ea stood the *'unu*—carved posts or planks dyed red, which

are known only from descriptions and old illustrations. Certain posts were surmounted by a wooden bird, meant to attract or to symbolize living birds—messengers of the gods. Other columns, very simply carved, supported platforms destined to receive offerings.

Numerous plants, ornaments, tresses, and garlands of coconut leaves were added to the wooden sculptures on ceremonial days. Sculptures in human form, only moderately sized examples of which have survived, formed a varied range, from plain posts of the human figure scarcely roughed out, to more or less realistic statuettes, sometimes dressed in tapa bark cloth, which the Marquesans called *tiki.*

Stone statues of the gods watched over the sacred sites. The more important tikis were kept on the me'ea and were used in various cannibalistic rituals. Certain of these tikis served as boundary signs to mark the limits of properties or as markers indicating an area in which the animal or vegetable resources were temporarily stricken with disease. The tikis apparently symbolized the dead and the divinized ancestors as a symbol of fecundity. The tiki appears to be a synthesis of all the signs of fertility: to its fetal appearance are often added feminine attributes, more rarely masculine.

The tikis have common characteristics: the low head, elongated in the front and back, lies immediately on the shoulders; the face, triangular in shape, is finished at the base almost in a point. The features, which are not always clearly designed, vary from one example to another; but in most cases, goggle-rimmed eyes bulge over flaring nostrils and a half-opened mouth through which a tongue tip protrudes. The ears were indicated by earphone-like projections. The body is squat; the line of the shoulders, which is horizontal, is marked on either side of the head by a flat ledge, which is often prolonged onto the back. The tiny arms were flexed, while the hands, in highly stylized form, were clasped over the protruding abdomen. The legs—very bent—are scarcely marked or even non-existent on the stone tiki.

The photos shown here were taken in Nuku Hiva in December 1983. The tikis may be seen beneath the ever-encroaching brush, arranged alone or in small groups. Most are about three feet high, although a couple are as large as six feet. **FM**

Now Showing:

Music and Dance in Papua New Guinea

The color photos of Jordan Wright—65 in number—are included in the current exhibit, "Music and Dance in Papua New Guinea," on view in Gallery 9 through July 12.

The exhibit combines photography, everyday objects, and tape-recorded traditional music to present one aspect of a little-known people.

The exhibit has been organized by the Smithsonian Institution Traveling Exhibition Service (SITES) in cooperation with the University Museum of Archaeology/Anthropology of the University of Pennsylvania. The show is derived from the more than 4,000 photographs taken by Jordan Wright during the spring and summer of 1982.

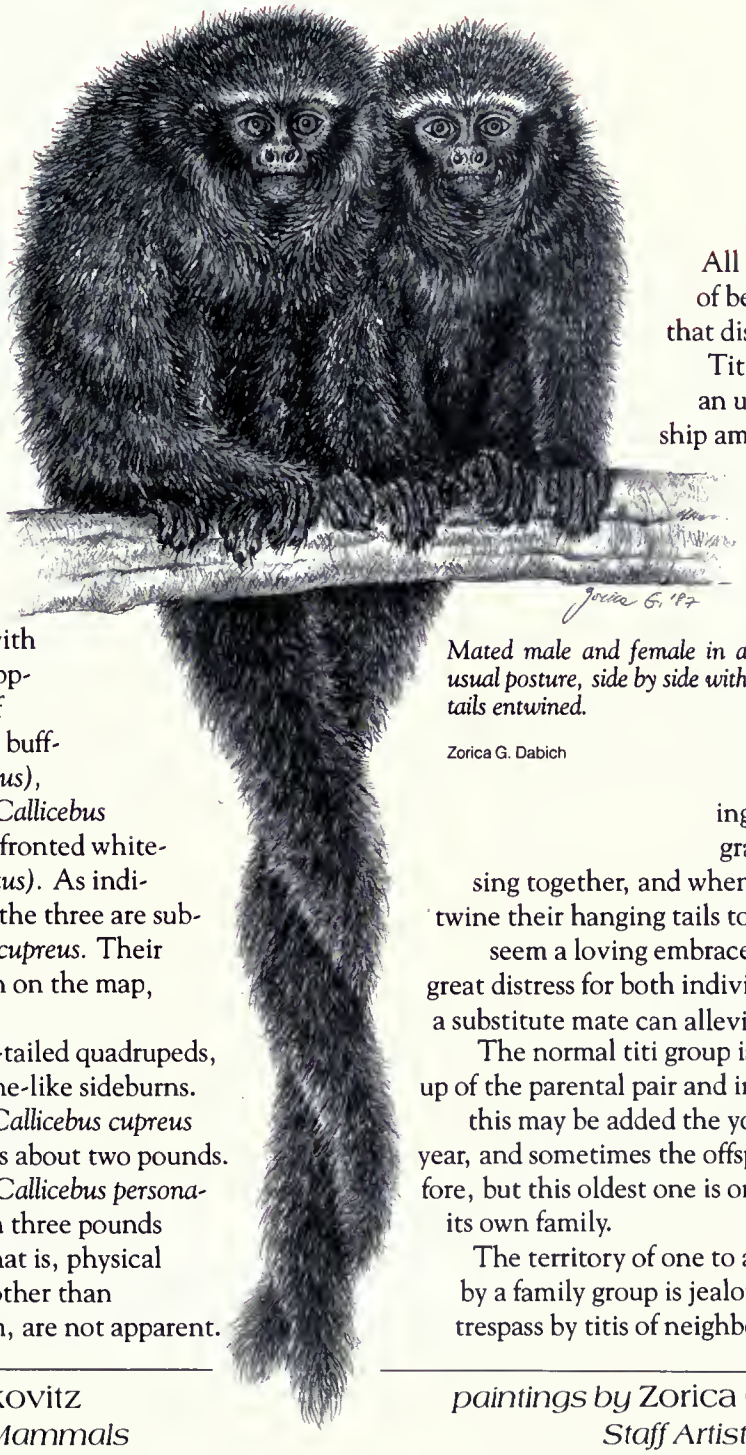
The highland people of Papua New Guinea were once divided into hostile tribes that spent much of their time in warfare and ritual preparation for warfare. Dances, elaborate costumes, and colorful body painting were part of this ritual. Today, however, these lavish displays are part of friendly competitions, and serve to preserve cultural behavior.

Mr. Wright's brilliant photographs convey the warmth and beauty of life today in the Highland Sepik villages of New Guinea. Highlights include exclusive photographs of the Sepik "welcome dance" and a series of photographs telling the story of a marriage.

Jordan Wright's pictures also show the festive events at the annual Mt. Hagen/Goroka Fair—an extravaganza of parading, dancing and singing. The elaborate music and dance competitions shown give evidence of a traditional life that has only recently been touched by contact with the 20th century.

THE TITI

South American monkeys remarkable for their monogamy and for an enduring union marked with special affection



Mated male and female in a usual posture, side by side with tails entwined.

Zorica G. Dabich

The small, colorful South American monkeys of the genus *Callicebus* (family Cebidae), commonly known as titis, live in tropical forests east of the Andes Mountains in Colombia, Venezuela, Ecuador, Peru, Bolivia, northern Paraguay, and most of Brazil.

At least ten species are distinguishable, some of them with two or more subspecies. The coppery titis, illustrated here by Staff Artist Zorica G. Dabich, are the buff-headed *(Callicebus cupreus cupreus)*, the white-fronted red-handed *(Callicebus cupreus discolor)*, and the white-fronted white-handed *(Callicebus cupreus ornatus)*. As indicated by their scientific names, the three are subspecies of the species *Callicebus cupreus*. Their geographic distribution is shown on the map, page 13.

Titis are long-haired, long-tailed quadrupeds, most of them with colorful, mane-like sideburns. A full-grown titi of the species *Callicebus cupreus* is the size of a rabbit, and weighs about two pounds. An adult of the largest species, *Callicebus personatus*, of eastern Brazil, may weigh three pounds or more. Sexual dimorphism, that is, physical differences between the sexes, other than those of the reproductive system, are not apparent.

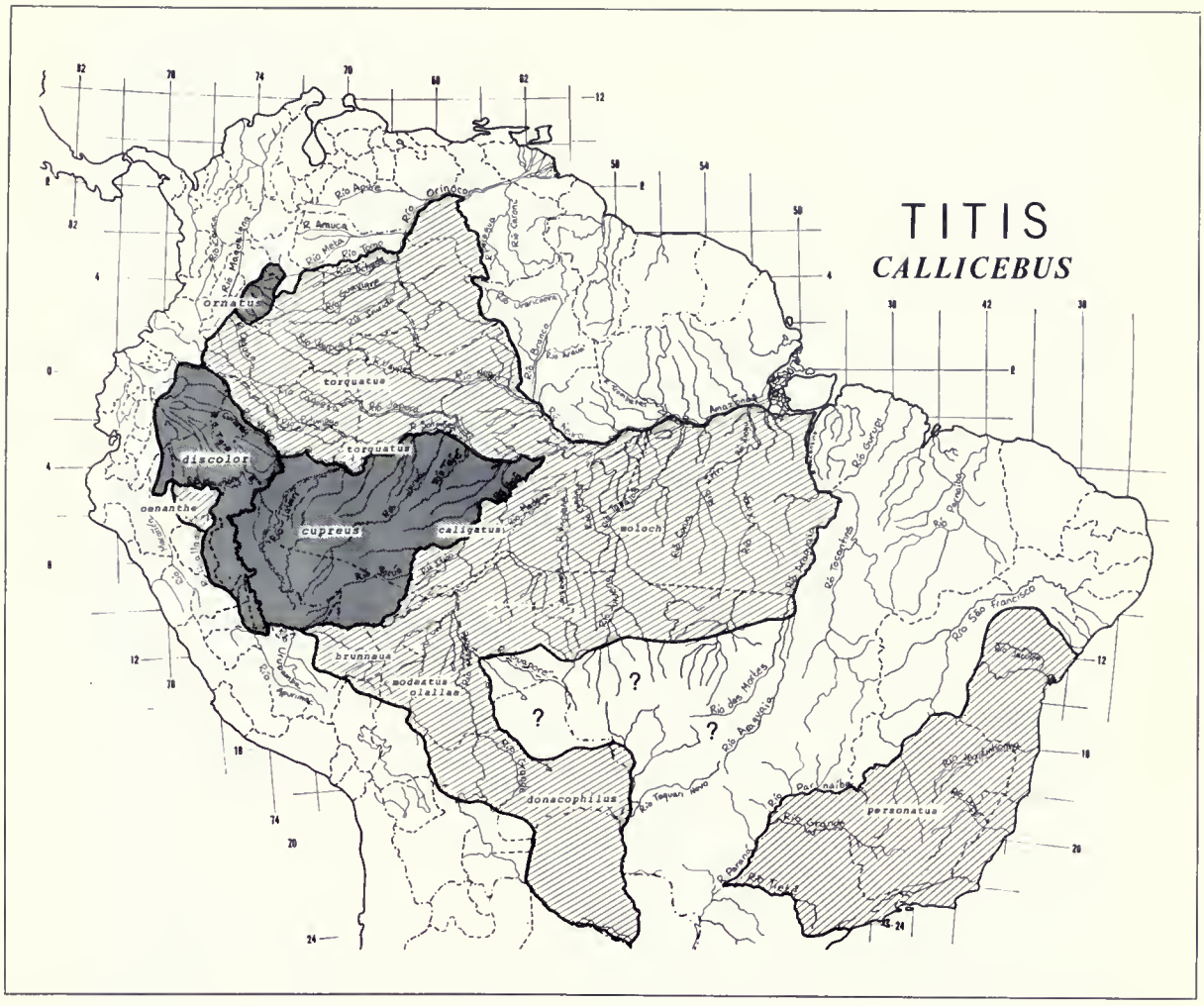
All titis share a number of behavioral characters that distinguish the genus. Titis are monogamous, an uncommon relationship among primates. Most particular is a close and enduring bond between titi pairs unmatched in other New World monkeys. The male and female stay close whether traveling, eating, resting, or sleeping. They hold hands, grasp feet, smack lips, sing together, and when resting side by side twine their hanging tails together in what may seem a loving embrace. Separation causes great distress for both individuals that not even a substitute mate can alleviate.

The normal titi group is a family unit made up of the parental pair and infant of the year. To this may be added the young of the previous year, and sometimes the offspring of the year before, but this oldest one is on its way out to start its own family.

The territory of one to a few acres occupied by a family group is jealously guarded against trespass by titis of neighboring groups. Home

by Philip Hershkovitz
Curator Emeritus of Mammals

paintings by Zorica G. Dabich
Staff Artist



Northern South America, with bold outline delineating known limits of geographic range of the genus Callicebus. *Dark shaded areas show range of* Callicebus cupreus *with its subspecies* ornatus, discolor, *and* cupreus. *The light shaded areas include ranges of species of* Callicebus torquatus, C. oenanthe, C. caligatus, C. moloch, C. brunneus, C. modestus, C. olallae, C. donacophilus, *and* C. personatus. *Two species of undetermined status are omitted. Titis may also occur in the unshaded area marked "?" Note gap in distribution between* Callicebus cupreus ornatus *and* C. cupreus discolor, *and between* Callicebus personatus *and remaining species of the genus. Map by Jennifer Blitz.*

range limits are staked out by force of voice. At the break of dawn, the awakened family unit makes its stand on a tree limb at the periphery of its home ground. From this vantage point it engages in a duetting duel, pitching voices against response in kind by confronting neighbors perched in another tree at the boundary. Vocalizations can carry for a mile and often stimulate answering calls from distant groups. There is little overt aggression during confrontations. There may be some chasing and brawling, with the invader of either side quickly repelled, usually with little or no damage to either party. It has been observed, however, that during the height of battle and the heat of breeding season, a gallant from one side may make a quick end run to the other side, hurriedly pay his respects to a receptive female, and dodge back to his lines before the momentarily distracted consort becomes aware of any transgression.

Duetting as performed daily by titis is a rare mammalian phenomenon. Only some Asiatic gibbons among nonhuman primates practice it, and probably not for the same purpose. Duetting by a titi pair, often with accompaniment by offspring, ensures the exclusiveness and stability of the group's home range and, except for an occasional peccadillo, the integrity of the monogamous bond.

One young is produced each year toward the begin-

Buff-headed titi, Callicebus cupreus cupreus

White-fronted red-handed titi, Callicebus cupreus discolor

ning of the rainy season. Gestation is roughly 5½ months. The neonate, born with eyes open, weighs 90-100 grams, or about a tenth of its mother's weight. Following the first nursing, which occurs within 2 to 4 hours, the infant is picked up by the father, who takes over completely except for the daily nursing and grooming periods provided by the mother. The young clings to its father's back for about a month before venturing to move about independently, a few minutes at a time. By the age of four or five months, or when weaned, the young is completely independent. The whitish frontal band characteristic of adult *ornatus* and *discolor* may not appear until the fifth or sixth week of postnatal development. Complete adulthood is attained during the third year.

Food taken in the wild consists mainly of fruit, flowers, buds, and leaves. A small quantity of insects may be ingested, but in captivity meat in some form is eaten regularly.

It is a joy to watch these beautiful, peaceful, engaging monkeys and a delight to hear them. Their activities provide a wealth of knowledge of the world we live in and, as exemplified by a plucky female, how to live in it. This individual, a wild-born captive of the subspecies *Callicebus cupreus ornatus,* was in poor flesh and fur. It was losing strength rapidly despite every care received during six weeks in the hospital of a primate research center in Covington, Louisiana. As a final resort, it was let loose in the center's outdoor enclosure. This titi was last seen in the station 10 June 1968. Five months later, on 6 November, it was brought to the center by a local squirrel hunter who had shot it in a wooded area six miles

White-fronted white-handed titi, Callicebus cupreus ornatus

to the south. The autopsy revealed a miraculous recovery. The animal was in excellent physical condition, fat, well-muscled, with fur coat in prime condition, and a voracious appetite proven by a stomach full of partially digested fruit, acorns, flowers, leaves, pollen, and insect wings.

The most valuable sources used in the preparation of this article are published accounts by Dr. William A. Mason and Dr. Warren G. Kinzey. Dr. Mason spent most of 1964 in eastern Colombia in pioneer studies of titis in their natural habitat. His labors in comparative behavior continued in the primate centers of Tulane University and is ongoing in the University of California at Davis. Dr. Kinzey, of the City College of New York, initiated studies of wild-living *Callicebus cupreus discolor* and *Callicebus torquatus* in Amazonian Peru during 1974, with continuations into 1981. During 1977 he studied the eastern Brazilian *Callicebus personatus* in its natural habitat. My encounters with titis were in Colombia, Ecuador, Peru, and Brazil.

Callicebus is one of six genera of cebid monkeys treated in the second volume (in preparation) of my monograph *Living New World Monkeys.* The first volume, on marmosets, tamarins, and the callimico, was published in 1977 by the University of Chicago Press. *

I am indebted to Zorica G. Dabich for the paintings of the three titis, each a masterpiece, and sketch of the tail-twining titis, and to Jennifer Blitz for the geographic distribution map. **FM**

*Available at the Museum Store, $110.00, ten percent discount for members.

WILL CHALMERS Field Museum's First Mineral Collector

by Edward Olsen
Curator of Mineralogy

People collect everything. There are collectors of bottle caps, stamps, matchbooks, barbed wire, fossils, antique cars, beer cans, minerals, Aztec pottery, swizzle sticks, bubble gum cards—to list only a few. It seems to be some kind of instinct. Some of us return from a summer vacation with pockets full of pretty pebbles picked up from the beaches and stream bottoms of the world. The instinct goes far back into our history on this planet. A Stone Age burial site in Europe contains the remains of a man surrounded by a collection of pretty pebbles, bits of mineral crystals, and some fossils. We can speculate that he was buried with his personal collection—an early attempt to flout the maxim about not being able to "take it with you."

Collections are the bread and butter of natural history museums. Inveterate collectors regard the museum curator as having the ultimate job. Imagine, getting paid to collect! The collections in natural history museums are, hopefully, made more carefully than the pockets full of pebbles. The reasons for museum collections are more than just to satisfy a long-held human instinct. Natural history museums have become the storehouses of materials on which a portion of the scientific community depends for its research. The curators have to know the materials in their collections, and know how to intelligently add to them. Adding objects to a given collection isn't always easy. It may turn out that sources don't exist for some items—as, for example, some minerals once known from long closed-down mining operations, or are from parts of the world that are currently politically unstable.

Adding to collections is done in several ways—collecting yourself, purchasing required items from persons, trading with other museums or individual collectors. One of the most successful ways, however, is to seek to become the place where serious collectors leave their collections, either during their lifetimes or in bequests. After any good collector has spent a large part of his life getting together a top-notch collection, sooner or later he becomes concerned about its future status—after he is no longer around. It often happens that family members are not particularly interested in such collections and it becomes clear to the collector that one day it will all be sold off or, worse, tossed out by an unknowledgeable relative. At this stage, some collectors make an approach to a large museum. Through its almost century-long history the Field Museum has been the repository of some outstanding collections, received in just this way, from collectors looking for a good home for them.

When the Museum was very new, back in 1894, one of its first trustees was also a shrewd collector of mineral specimens. William J. Chalmers, known to his friends as Will, got into mineral collecting through his business operation. He was a partner in the company of Fraser & Chalmers, which manufactured heavy mining machinery. In those days the Great American West, as well as much of the Middle West and the East, was heavily worked by numerous metal mining operations. In the course of selling equipment to mining companies, Will Chalmers traveled and visited many operating mines. In the process he became aware of beautiful minerals that are sometimes the ores being mined, but more often are the minerals associated with the ores—what miners call *gangue* minerals. Gradually, he picked up the best examples of many minerals and started what was to grow into a first-rate collection.

In those days, getting together a good mineral collection was generally not done by midwesterners. Chicago is located right in the heart of a mineralogical wasteland! For many hundreds of miles in all directions around Chicago there are very few really interesting mineral collecting localities. East coasters, on the other hand, are located close to dozens of well-known mineral collecting localities. The difference is in the rock types of the region. A New Yorker can go out on a weekend to a dozen localities and find many fine mineral specimens. A Chicagoan can't. Considering his roots in Chicago, Will Chalmers would probably never have collected minerals had he not been in the mining machinery business.

He was born in 1852 on what is now the near west side of Chicago, the area of the present University of Illinois-Chicago Campus. His father, Tom Chalmers, had come there from Glasgow, Scotland in 1842 and was settled into a small enclave of Scots, Welsh, and English. After high school, Will was apprenticed to the

Eagle Works Manufacturing Co., where he learned to be a skilled mechanic. His father was the general superintendent at Eagle Works. At the age of 20 he and his father started the business that became the Fraser & Chalmers Co. The company became the world's largest manufacturer of mining machinery. He became president of the company in 1891.

Right in his own neighborhood, Will met a fascinating young woman. Joan Pinkerton was the daughter of Allan Pinkerton. She was born in a house at Monroe and Laflin Streets, and lived with her family on what was then called Reuben Street—the present-day Ashland Avenue. Her father had started America's most famous detective agency, Pinkerton's. It was his agency, and he himself on many occasions, that became the first bodyguards of American presidents. This force of bodyguards later evolved into the present-day Secret Service. Young Joan, through her father's business, met many of the famous men of her day. When she was young, General Phil Sheridan would come to visit and sit on the porch of the Pinkerton house, watching in wonder as Joan wildly raced her horse up and down Ashland Avenue! Sheridan, at the time, was in charge of the western department of the Army, which was involved in the tragic wars with the Plains Indians.

Joan and Will were married in 1878 and Joan assumed the role of social arbiter of the Western Division of Chicago society. In those days there were three divisions—the West, the North and the South. Today, it seems strange to think of a near west side high society, because the area has been commercialized for so many years. In those days the Western Division was a force to be considered. It was the area of the famous Bertha Honore, daughter of Henry H. Honore (there's a street named after him), who built a southern-style mansion plunked in the middle of a whole square block edged by Ashland Avenue and Jackson Boulevard. Bertha married Potter Palmer, and became the formidable Mrs. Potter Palmer, the first real queen of Chicago society.

Joan was interested in charity functions. In those days, Chicago was the destination of many national groups from Europe seeking homes and jobs. There were essentially no government social programs. Settlement depended on the efforts of people like Jane Addams, with funding from private individuals, especially Chicago society. Will became involved in a number of civic activities. He served as a director of the World's Columbian Exposition in 1893 and was, for a time, a member of the Chicago Board of Education. When the Field Museum was formed (then called the Field Columbian Museum) he became a member of its board of trustees.

His business grew, as did his mineral collection;

William J. Chalmers 67219

however, as time went on, new mining operations in the United States were not starting up as often as in the past. Large regions of America were becoming more and more agricultural. Other mining machinery companies emerged and offered stiff competition. With the gradual change, Fraser & Chalmers began to suffer difficulties. Just about that time, Will Chalmers met a man named Edwin Reynolds. Reynolds was the senior engineer for the Edward P. Allis Company of Milwaukee, a company that manufactured heavy machinery. The result of their casual meeting was ultimately a merging, in 1901, of four machinery companies, the Allis Co. of Milwaukee, Fraser & Chalmers and the Gates Iron Works—both of Chicago, and the Dickson Manufacturing Co., of Scranton, Pennsylvania. The new company was called the Allis-Chalmers Company. As the years went by, this company evolved into a leading maker of farm implements, as well as a line of heavy industrial machines. Mergers of large companies often create difficulties for the individuals involved. After several years of problems

along the management of the four companies, Will Chalmers, who had become vice president of Allis-Chalmers, decided to resign in 1905.

His interest in minerals continued, and his wife had caught the "bug" during the years of their marriage—they both had mineral collections! He served on the Field Museum Board of Trustees until his death in 1938, at the age of 86. In his will he bequeathed his mineral collection to the Field Museum, and made an initial endowment of funds to help with the upkeep of the collection, additions to the mineralogical collections, and research on minerals. Later, in Joan Chalmers' will, she also gave the Museum her mineral collection, and made an additional endowment fund for the same purposes.

Ron Testa 84878

The 5,900-carat Chalmers Topaz, on view in the Grainger Hall of Gems

Over the years, the Chalmers mineral collection has been a strong asset to the Field Museum. Besides giving us great specimens for exhibit, it has provided faculties and students with many samples for research. Projects such as crystal structure determinations, crystal structure refinements, analytical standards, lead isotope measurements, and oxygen isotope homogeneity studies have been made using specimens from the Chalmers collection. The Chalmers Fund has been equally valuable. In Will Chalmers' day, mineralogical research was done with simple tools and microscopes. By the late 1950s, however, no serious research could be done without the use of X-ray diffraction equipment. With the accumulated endowment earnings of the Chalmers Fund the Museum could easily afford to purchase an X-ray diffraction laboratory. From it, dozens of research papers have resulted, and new minerals have been discovered. Today, research on minerals involves the use of large machines like electron microprobes, analytical electron microscopes, electron diffraction equipment, and ion microprobes. These machines, ranging in price from $200,000 to $1.5 million, are too expensive to be supported by any one institution, with annual upkeep costs that range in the hundreds of thousands of dollars. With Chalmers Fund monies it has been possible to pay for use time on this entire array of equipment in different laboratories around Chicago. The research yield, over the decades, has been impressive.

Some years ago, the Museum had the chance to purchase a spectacular, 5,900-carat faceted topaz for its exhibit collection. It was purchased using earnings from the Chalmers Fund and was suitably given the name, the Chalmers Topaz. It is the centerpiece of the Museum's new Grainger Hall of Gems. We know that Will and Joan Chalmers would have been pleased with it. FM

1986 Volunteers Honored

Field Museum honored its 1986 volunteers at a special buffet supper on April 28 in Stanley Field Hall. It was fitting that the event recognizing the volunteers for their service to Field Museum was held during National Volunteer Week 1987.

In a brief ceremony, Ellen Zebrun, volunteer coordinator, welcomed the volunteers to the evening's festivities. Willard L. Boyd, president, speaking on behalf of the trustees and staff, expressed the gratitude felt for the invaluable contribution made by the volunteers. Noting the importance of the volunteers to the ongoing success of Field Museum, Dr. Boyd highlighted the volunteer activities in 1986. He then recognized the six volunteers who had given over 500 hours of service.

During 1986 the volunteer contribution of 37,686 hours of service was the equivalent of 21 additional full-time staff members. Last year's special exhibit, "Te Maori: Maori Art from New Zealand Collections" was staffed entirely by volunteers. This volunteer force gave 1,900 hours of service, including tours of the Museum's Maori meeting house for 30,000 visitors.

These figures are impressive; equally impressive are the number of years the volunteers stay with the program. Of the 250 current volunteers, 20 percent have been volunteering for over three years, 25 percent for over five years, and 18 percent for over 10 years. The volunteer program at Field Museum is now in its nineteenth year, and 4 percent of the volunteers have been with the program for over 15 years.

Volunteer opportunities at Field Museum are diverse—volunteers work in the scientific and administrative areas as well as in the public areas such as the Education Department and Membership. Volunteers catalog, label, prepare specimens, charts, maps, and scientific illustrations, do research, edit, type, and file. They also lead tours for school groups and the public, and staff the Pawnee Earth Lodge and Place for Wonder. Many of the volunteers, especially those serving on weekends, have full-time employment in addition to their contribution of time and service to Field Museum; they are excellent role models for others to follow.

Because of the wide range of opportunities, Field Museum volunteers cover a broad spectrum of experience, education, vocation, and interest. Some volunteers are now or have been executives in the private sector or educators, for others this is a first work experience. Most volunteers come from Chicago and its suburbs, but some come from downstate Illinois, southern Wisconsin, and northern Indiana.

There are volunteers with doctoral degrees, while others never finished high school. Some volunteers are still in school, gaining experience for their resumes; some volunteers are retired and looking to explore new interests. The volunteer program at Field Museum has something to offer everyone.—*E.Z.*

Volunteers with More than 500 Hours of Services

Barbara Beardsley—Education: Jaci Tomulonis, supervisor
Sophie Ann Brunner—Amphibians and Reptiles: Hymen Marx, supervisor
David Matusik—Insects: Stephen Ashe, supervisor
William Roder—Tours: Dorothy Roder, supervisor
Llois Stein—Anthropology: Phillip Lewis, supervisor
Tom Tatner—Botany: John Engel and Honora Murphy, supervisors; —Birds: David Willard, supervisor

More than 400 Hours

Sol Century—Anthropology: Bennet Bronson, supervisor
Peter Gayford—Anthropology: Bennet Bronson, supervisor
Frank A. Greene, Jr.—Geology: Mary Carman, supervisor
Lillian Kreitman—Membership: Gregory Porter, supervisor

More than 300 Hours

Jackie Arnold—Education: Mary Ann Bloom and Marcia MacRae, supervisors
Margaret Axelrod—Education: Mary Ann Bloom and Edith Fleming, supervisors
Dennis Bara—Membership: Gregory Porter, supervisor
Larry Berman—Fishes: Terry Grande, supervisor
Ingrid Fauci—Amphibians and Reptiles: Hymen Marx, supervisor
Halina Goldsmith—Education: Mary Ann Bloom, supervisor
Robert Gowland—Anthropology: Ronald Weber and Christine Gross, supervisors
Margaret Martling—Botany: William Burger, supervisor
Carolyn Moore—Anthropology: Bennet Bronson, supervisor
Dorothy Oliver—Library: Michele Calhoun, supervisor
Naomi Pruchnik—Botany: Stephen Dercole, supervisor
Sara Rosenbloom—Education: Mary Ann Bloom and Philip Hanson, supervisors
Carol Schneider—Botany: Michael Huft, supervisor
Maxine Walter—Zoology: Anita del Genio, supervisor
Mary Wenzel—Insects: Rupert Wenzel, supervisor

A complete listing of Field Museum volunteers will be published in the July-August 1987 issue of the *Bulletin*, which is the 1985-86 Biennial Report.

Injury and Diseases In Fossil Animals

The Intriguing World of Paleopathology

by Glen T Sawyer and Bruce R. Erickson

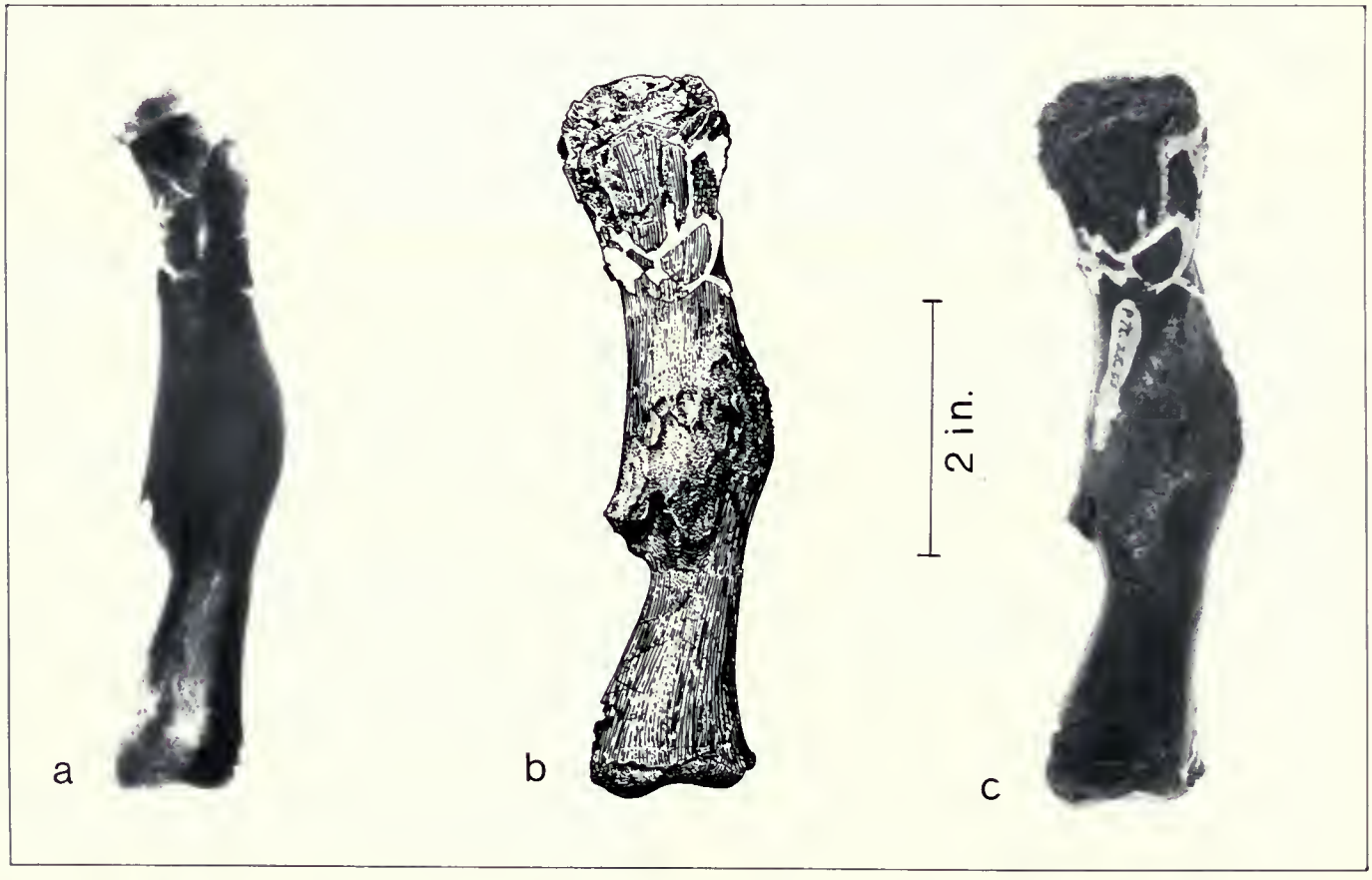
We must understand the past in order to arrive at a complete understanding of the world in which we live. The environments of the distant past, the plants and animals that existed then, their relationships to one another and to their surroundings—all should be considered when studying the physical world.

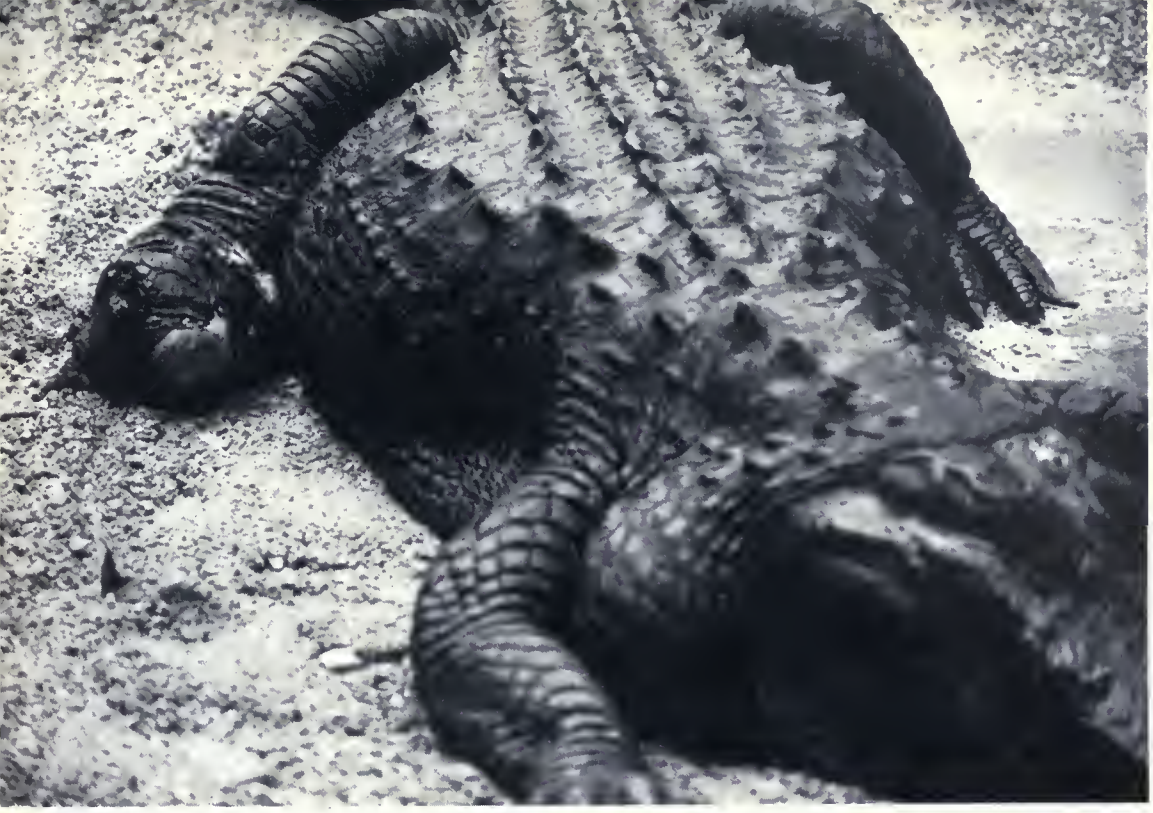
Disease states in animals that are a result of behavioral characteristics or environmental factors are certainly of interest in such studies. Any branch of pathology, whether it be human or veterinary pathology, should include an extensive in-depth investigation into comparative pathology. The study of the nature of disease in the distant as well as the more recent past gives historical perspective and adds greatly to pathology as a scholarly discipline.

Paleopathology, as a branch of vertebrate paleontology, has been relatively neglected in scientific

This article is reproduced, with slight emendations, from Encounters, *courtesy of the publisher, the Science Museum of Minnesota.*

1. Exhibits for analyzing a healed fracture of the tibia (large bone of lower hind leg) of the fossil crocodile Leidyosuchus: *(a) positive print of X-ray, (b) scientific illustration, and (c) photograph. The same view is presented in each case.*





Bruce R. Erickson

2. American alligator with right hind foot missing (healed amputation).

literature. Descriptions of abnormal fossilized bones and teeth have usually been appended to papers on other subjects or merely dismissed as interesting oddities. Only in recent years has science come to realize the importance of the wealth of information contained in this part of the fossil record.

Paleontologists at the Science Museum of Minnesota have recently begun to catalog and systematically study all non-human vertebrate paleopathology in its collections. Any deviation from the "healthy," or normal, state which has left a visible imprint on the fossilized animal remains is being considered. Some examples are described and illustrated here.

These fossilized remains are parts of once living animals and when examined in this context, it is inevitable that one question the causes of death. The most common causes of death in wild animals are disease and trauma. Trauma includes predation, environmental

3. American alligator with dislocated lower jaw.

Bruce R. Erickson

4. Pond turtle with healed puncture in carapace.

Bruce R. Erickson

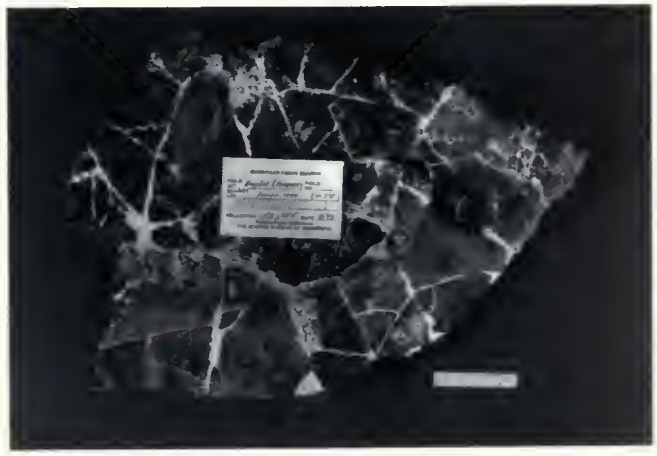
5. Matching punctured fossil turtle shell with fossil crocodile teeth.

accidents, and injuries that are a result of conflicts between individuals of the same or different species. Although the evidence of predation may be spectacular, individuals dying as a result of predation usually leave few remains. Their carcasses are usually consumed by the predator. When evidence of predation is recognized it usually indicates that the prey survived the encounter. When disease or trauma is relatively slow and/or sporadic in expression, the fossil record is often remarkable.

Non-human paleopathologic studies are often limited because only isolated fossil bones and teeth are available for study. Entire fossilized skeletons are rarely found with soft tissues, such as muscle, heart, lungs, and so forth, preserved. When a research project, such as one which has been carried out in western North Dakota at Wannagan Creek Quarry during the past twelve years, results in a massive collection of closely associated fossils, unique opportunities are presented for the study of an extinct environment with many examples of the animals that lived there, their diseases, and their injuries.

Like most tissue, bone is able to react to diseases or insult in only a limited number of ways. There may be localized or generalized excessive bone formation or a reduction in the amount of bone. The pattern of abnormal tissue change, its structure, and its distribution suggest the type of disease process involved. In general, disease processes fall into broad categories including traumatic (injuries), developmental, infectious, neoplastic ("tumors"), degenerative, metabolic, and vascular. The last three categories produce bone changes

6. Section of fossil turtle shell showing healed puncture wound.



R. Spading

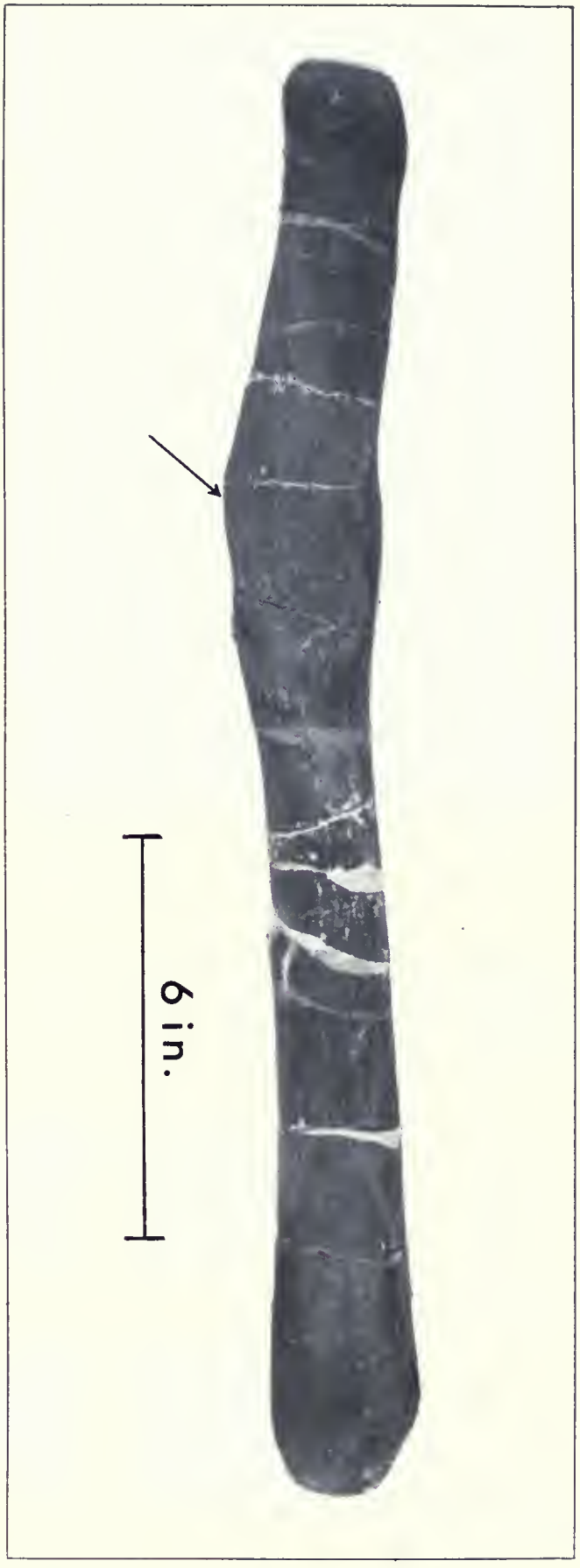
that are less specific, while traumatic, developmental, infectious, or neoplastic disease is somewhat easier to identify. There is no structural change that is absolutely specific for any disease, however.

In some cases fossil evidence of injuries, such as amputations, fractures, or puncture wounds, are interpreted after comparison to similar conditions in living relatives. For example, within a population of the living Indo Australian crocodile *Crocodylus porosus*, injuries occur more frequently in certain size groups. Young individuals of 10 to 20 inches in length (post-hatching) and individuals of five feet or more in length show the greatest number of head, limb, and tail injuries. This is attributed to the susceptibility of the former to attack from larger predators such as fishes, birds, and other crocodiles and, in the latter case, to encounters with prey species or conflict with their fellows related to social behavior and territoriality.

Similar circumstances resulting in injury and behavior of the same kind were present 58 million years ago and involved the large Paleocene crocodile *Leidyosuchus*. A healed fracture of a tibia (fig. 1) belonging to this form is typical of the type of incapacitating injury that occurs in living crocodiles as well. In addition to a photograph of the actual specimen, a technical drawing and an x-ray of the same specimen are shown. The drawing represents a technique useful in emphasizing detailed features for scientific publication and x-rays are, of course, helpful in scientific analysis. X-rays often indicate the nature and extent of a pathologic process in the substance of a tissue such as bone that cannot be seen with the unaided eye.

Figure 2 shows a living alligator with a right hind food amputation that most probably resulted from an encounter with another alligator or crocodile. We can only speculate about the coexistence of alligators and crocodile in the past, but today when they come together violent confrontations usually occur. Dislocation of an alligator's jaw, a common condition, is well seen in figure 3. This is most likely secondary to trauma.

Puncture wounds are frequently found in the upper shells of both fossil and living turtles. This feature relates strongly to behavior. A living pond turtle with such a wound is seen in a Florida river (fig. 4). Its close association with alligators leaves little doubt as to the cause of this injury. Our research at Wannagan Creek Quarry reveals that the same conditions are present in fossil turtles. Such turtle shell wounds often match, in size and



7. Healed fracture of radius (large bone of lower fore leg) of crested dinosaur (indicated by arrow).

R. Spading

8. *Compression fracture of dorsal vertebra of dinosaur* Camptosaurus.

spacing, large caniniform teeth in fossil crocodile skulls found in abundance in the same quarry (fig. 5). A fossil turtle shell with a partially healed puncture wound is seen in figure 6.

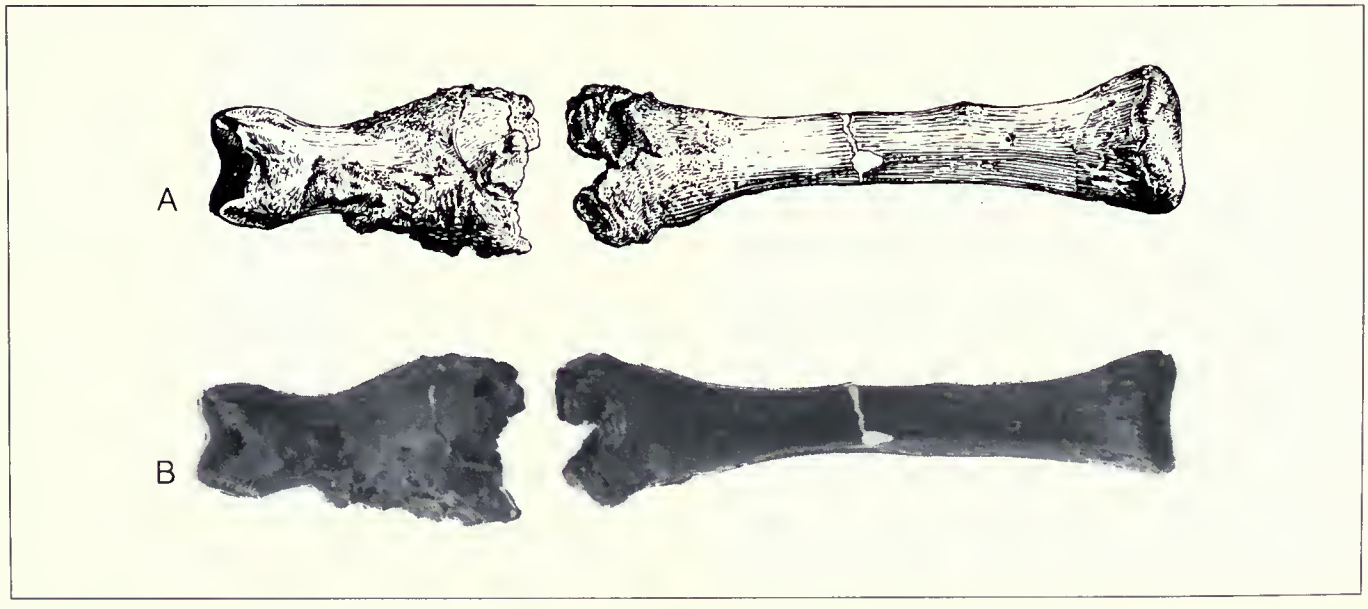
Dinosaurs also sustained injuries. Figure 7 shows a radius (a front limb bone) of a crested dinosaur from the Cretaceous beds of Alberta, Canada. This bone shows a healed fracture. There is angulation of the shaft and enlargement at the point of angulation strongly suggesting the formation of a healing "callus." As this hadrosaurian dinosaur was bipedal and walked mostly on its hind legs, the injury to its forelimb probably presented only a minor inconvenience, whereas the fractured tibia of the crocodile (fig. 1), which is quadrupedal in its locomotion, probably caused gait difficulty during the healing process.

Figure 8 shows another common dinosaur injury. This is a compression fracture of a back vertebra in *Camptosaurus*, a small iguanodont dinosaur that lived in Wyoming during the Jurassic period 140 million years ago. This type of fracture may often be associated with some localized degenerative arthritis of neighboring joints with excessive bone forming as spurs or lips around the joints.

Degenerative arthritis is a common condition in many vertebrates, including humans. It usually is characterized by erosion of surfaces of weight-bearing joints, with associated chronic inflammatory changes. However, localized trauma affecting a joint, such as a vertebral compression fracture, causes more wear at a joint than would otherwise occur.

Fossil vertebrates often have this type of arthritis. The most abundant large animal at Wannagan Creek

9. *Arthritic joint between two toe bones of fossil crocodile* Leidyosuchus: *(a) scientific illustration, (b) photo of same.*



10. Tooth abscess in lower jaw of young adult fossil bison (indicated by arrow).

11. Osteoma on bone fragment from late Cretaceous dinosaur (indicated by arrow).

Quarry, the crocodile *Leidyosuchus,* is no exception. An articulated metatarsal and phalange (a portion of a foot) in figure 9 are selected to show marked arthritis of the joint with extra bone formation around the joint but no obvious evidence of previous fracture.

Inflammation occurs when an injurious agent comes in contact with normal tissue. This defensive reaction by an organism may not be successful until after local tissue destruction creates a cavity. Attempts at repair and regeneration often follow and, in the case of bone, sometimes result in excess bone formation around or near the cavity.

Bacterial infection of bone may produce irregular cavities or draining canals with or without excess bone formation nearby (as a reaction to the inflammation). Figure 10 shows the results of a tooth abscess in a bison specimen of late glacial times found in Stearns County, Minnesota. The location of the pathologic process and the local bone destruction with irregular cavity walls suggest a localized bacterial infection.

Neoplasms (or "true tumors") have been defined as new and abnormal tissue growths which serve no useful biologic function and develop at the expense of the healthy organism. Neoplasms of bone tissue may be either benign or malignant. Probably the most frequent neoplasm found in both fossil and living vertebrate bone is the osteoma. This benign growth is illustrated well by figure 11, which shows a Cretaceous dinosaur bone fragment with probable osteoma, found in Garfield County, Montana.

Vertebrate paleopathological information greatly expands the basic pool of knowledge in general pathology. It is also used for paleoecological purposes. How plants and animals adapted to their environment, with their injuries and diseases, in the distant past has considerable bearing on present-day adaptation.

Why did the dinosaurs become extinct? This is an intriguing question but one that cannot be yet satisfactorily answered despite all of the theories. What ailed the dinosaurs and how their longevity might have been affected by injury or disease are questions which might be answered first. When answers are not found for such questions, they will likely come from the comparatively small but expanding collections of abnormal fossils in the museums of the world. **FM**

Glen T. Sawyer is research associate in paleontology at the Science Museum of Minnesota and assistant chief, Neurology Service, at V.A. Medical Center, Minneapolis. Bruce R. Erickson is curator of paleontology and head of the Science Division at the Science Museum of Minnesota.

FIELD MUSEUM TOURS

Kenya Tanzania Safari

February 20 to March 10, 1988
$5,245 per person
Leader: Audrey Faden

February 20: Your safari begins when you board your British Airways flight to London this evening.

February 21: Arrive London's Heathrow Airport this morning. You will be met and transferred to the Sheraton Skyline Hotel, where day-rooms will be provided until your British Airways flight to Nairobi this evening.

February 22: Upon arrival in Nairobi, you will be met and transferred to the luxurious Norfolk Hotel—a famous colonial landmark and one-time haunt of Teddy Roosevelt, Ernest Hemingway, and Robert Ruark. This afternoon, enjoy a half-day tour of Nairobi, visiting the colorful African market, the unique Kenyatta Conference Center, Nairobi University, and the famed National Museum, known for its superb natural history collection and watercolors by Joy Adamson. Continue your tour by driving through the suburb of Karen, where you will see Isak Dinesen's original home, now a museum. This evening there is a welcome cocktail party and dinner at the Norfolk, with guests of the East African Wildlife Society.

February 23: Today you head toward the famed Tsavo West National Park, Kenya's largest national park. View game through the park before arriving at Kilaguni Lodge for lunch. From the lodge, watch the game come to the nearby waterhole. After lunch, go out in search of the great elephant herds. Your drive takes you to Mzima Springs, where large pools of clear spring water surface at the rate of 50 million gallons a day. Occasionally hippos can be viewed from the tank and cormorants swim by.

February 24: Today you drive to Amboseli National Park, justly famous for its big game and superb views of Kilimanjaro. The 150 square miles of park embody four main wildlife habitats including open plains, acacia woodland, scrub brush, and freshwater swamps. Spend the afternoon viewing animals such as wildebeest, zebra, giraffe, lion, cheetah, elephant, and rhino. Amboseli Serena Lodge.

February 25: Start the day with a dawn game drive in this beautiful park. Early morning is also the best time to view Kilimanjaro before the clouds build up over the summit. Game drive in the late afternoon—the best time to see lion and cheetah as they begin to stir from the shade.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

February 26: Today you drive to Tanzania via the Namanga border, passing through minimal immigration formalities. Continue on to Gibbs Farm, a small, quaint farm in the midst of coffee plantations.

February 27: Today transfer to Ndutu Safari Lodge, situated on the shores of Lake Lgarya near the southeastern corner of Serengeti National Park. Here you will enjoy game-viewing drives both morning and afternoon.

February 28: Today you have game-viewing drives both morning and afternoon to explore the vast Serengeti plains. Here millions of wildebeest and zebra mill across the plains, seeking fresh grasses. You see large prides of lion, perhaps a leopard resting in a tree, groups of hyena, a mother cheetah teaching her cubs to hunt, giraffe, gazelle, topi, and kongoni—the list is endless. Ndutu Safari Lodge.

February 29: This morning you will drive into the Olduvai Gorge, the site of Dr. and Mrs. L. S. B. Leakey's famous discovery of the fossil he called *"Zinjanthropus boisei"* (now classified *Australopithecus boisei*). Here you will enjoy a visit to the small but very informative museum and a short talk by one of Mrs. Leakey's assistants, who will escort you to the site of the *"Zinj"* discovery. Continue on to one of the natural wonders of the world, the Ngorongoro Crater, a caldera created by the prehistoric collapse of a volcano cone. On the crater floor, herds of typical plains mammals live out their destinies: buffalo, zebra, wildebeest, Grant's Gazelle, Thomson's Gazelle, lion, and hyena. Ngorongoro Wildlife Lodge.

March 1: Today we spend down in the crater, tracking and photographing the animals. This great caldera contains some of Africa's finest black-maned lion. Rhino can be seen with calves, and waterbuck appear not to notice the visitors, enabling photographers to shoot at ease. On the lake in the middle of the crater, you can watch thousands of flamingos.

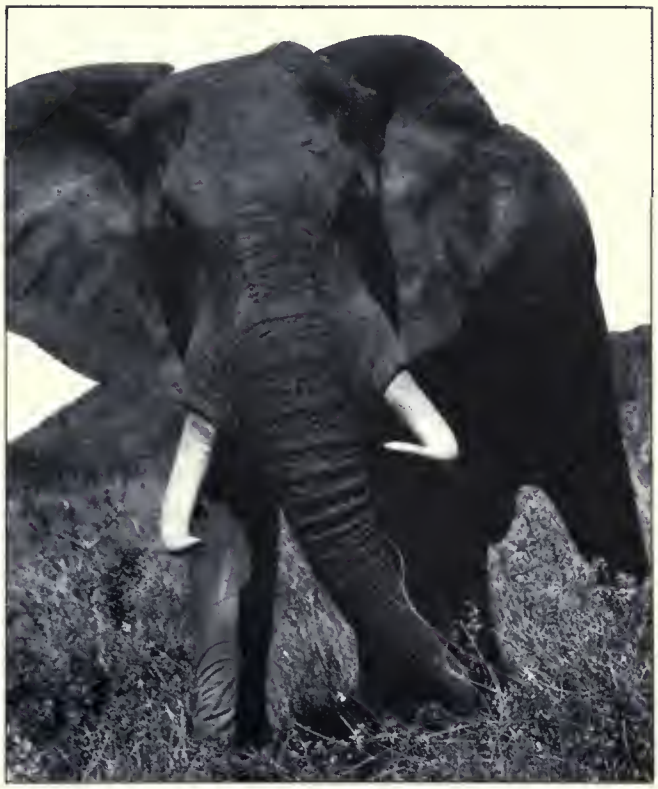
March 2: Descend into the crater once more early this morning for your last game drive here. Later depart to Lake Manyara Hotel, set on the edge of the Great Rift Valley and overlooking Lake Manyara National Park.

March 3: Enjoy a full day exploring the Lake Manyara National Park. This park contains five vegetation zones, thus supporting a large variety of fauna. Notable are the elephant herds and the tree-climbing lions.

March 4: Drive to the Namanga border where your Kenyan drivers will meet you for the drive back to Nairobi.

March 5: This morning you head northwest through undulating Kikuyu farming country, reaching the Aberdare Country Club in time for lunch. Transfer to special club vehicles for your game run to the Ark, which will take you into a deep forested area alive with some of the finest game viewing in Kenya. Driving along the animal trails and paths, you may suddenly come upon elephant, rhino, giant forest hog, Cape buffalo, waterbuck, bushbuck, warthog, colobus monkey, cerval cat, leopard, and perhaps the bongo antelope. The Ark is 'berthed' over a waterhole where the animals come to drink. From an underground dungeon you have an eye-to-eye view of this constantly changing scenario. Darkness descends, but floodlights permit game viewing well into the early morning hours!

March 6: Return to the Aberdare Country Club through the forest and clearings bright with clear morning light. Your safari driver will be at the club to greet you and you head north along



the slopes of Mt. Kenya, then continue on, descending nearly 6,000 feet, passing through the town of Isiolo where your vehicle will suddenly be surrounded by smiling Kenyans holding out wares for you to buy, such as copper bracelets, necklaces, and bangles. Bargain away if you wish, it's expected. View game as you drive through Samburu Game Reserve to the lovely Samburu River Lodge, located on the Uaso Nyiro River.

March 7: Today you have both morning and afternoon game viewing of Samburu's typically 'northern' game—reticulated giraffe, Grevy's zebra, graceful long-necked gerenuk, Somali ostrich and vulturine guinea fowl, none of which you will see further south. Samburu is also a very good park for elephant and the elusive leopard. It is an excellent place for the photographer, with the park's vivid colors and the contrasts between sky, bush, and sand. Bird enthusiasts will be well rewarded with over 300 species, including the martial eagle, in this reserve.

March 8: Board minibus and drive to the famous Mount Kenya Safari Club. Here you have the remainder of the day to luxuriate at this private club made famous by the late William Holden. There is golf, tennis, heated swimming pool, horseback riding, two lovely shops, a beauty salon, sauna, and many attractive rooms set aside for drinking tea or something stronger. The view of Mount Kenya is awesome as are the finely manicured grounds.

March 9: Drive back to Nairobi where rooms will be provided at the Norfolk Hotel until your transfer to the airport for your flight to London.

March 10: Arrive London, where you will connect with your British Airways flight to Chicago arriving later the same day.

This tour will be operated by Abercrombie & Kent.

We still have space on the "Project Canadian Fjords" scheduled for August 16 to 24, aboard the *Society Explorer.* Please call for further information. Field Museum's leader is Dr. Scott M. Lanyon.

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
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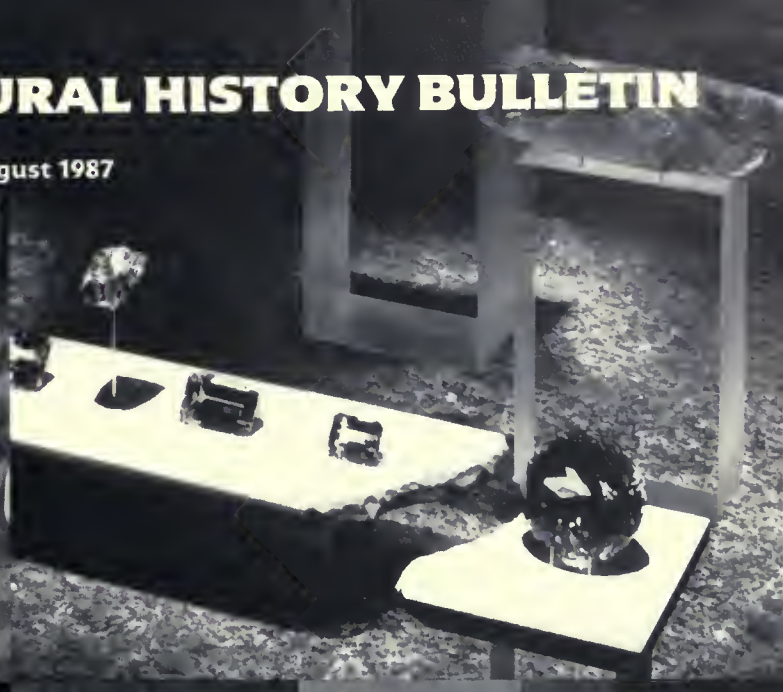
July/August 1987



Biennial Report 1985-1986

Field Museum of Natural History Bulletin

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Founded 1893

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COVER

A photo montage suggesting the breadth of activity at the Field Museum of Natural History during the last biennium. Each of the photos appears in the body of the report.

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EVENTS

After Hours at the Field

Fridays* in July

5:30pm, West Entrance

*no film July 3

FREE

Feature-length films from around the world continue! On Friday evenings in July films from New Zealand and Australia will be shown. Light refreshments are available for purchase during the evening. Be sure to use the West Entrance to the Museum. For more information call (312) 322-8855.

"The Last Wave"

July 10

1978. 106 minutes. Color.
Australia.
Director: Peter Weir.

In this supernatural thriller, an Australian lawyer becomes involved in the Aboriginal spirit world when he defends five Aborigines accused of a ritual murder of another tribe member. Dreamlike and fantastic, this film mesmerizes and terrifies as it explores ancient Aboriginal mythology.

"Uta"

July 17

1984. 104 minutes. Color.
New Zealand.
Director: Geoff Murphy.

In the late 1800s, a Maori village is destroyed and its inhabitants massacred by colonial troops. The slaughter is discovered by Te Wheke, a Maori warrior, now working for the soldiers. The dead are Te Wheke's own people. In grief and rage, the Shakespeare-quoting warrior prepares his revenge. Note: This film opens with graphic violence.

"The Chant of Jimmie Blacksmith"

July 24

1978. 108 minutes. Color.
Australia.
Director: Fred Schepisi.

In 1900, on the eve of the birth of the Australian nation, a half-caste Aborigine named Jimmie Blacksmith, after enduring a life of racism, murders the family of his employer. He then embarks on a bloody flight across thousands of miles of the breathtaking countryside of New South Wales. Based on a true incident, this powerful film delves into the hero's motivations and is underscored with a pervasive sense of tribal and natural mystery.

"Walkabout"

July 31

1971. 88 minutes. Color.
Australia.
Director: Nicolas Roeg.

Set in Australia's outback, *Walkabout* is Nicolas Roeg's magical exploration of the rites of passage of three young children and the changing world around them. Two European children, abandoned by their father in the desert, are found by a young Aborigine boy. Together they enjoy the beauty of the unspoiled natural world until they happen upon civilization.

This film is preceded by an ethnographic film on the Walbiri Society of Central Austraia, *A Walbiri Fire Ceremony: Ngatjakula,* 1977, 21 minutes, color, directed by Roger Sandall, edited from a version by Kim McKenzie.

Continued →

E·V·E·N·T·S

Summer at the Field

Hall Interpreters Programs

Thursday through Sunday
July and August

Spend your summer exploring the wonders of Field Museum. Young and old delight in discovering fossils in the Museum's marble floor, participating in a shadow puppet performance, comparing the horns and antlers of mammals, and watching the many ways seeds travel. Hall interpreters, dressed in blue aprons and located throughout the exhibits, help you experience the wonders of the world. Join a hands-on journey through the Museum. Watch Indian food being prepared. Try your hand at carving, using an Indian adze. These exciting programs are available to all visitors Thursday through Sunday. Please consult the television monitors throughout the Museum for activity locations.

World Music Programs

Music communicates in many ways. It is something that can be shared by all of us, whether or not we have common lifestyles, beliefs, or even languages. The July and August programs feature the lively percussion of Don Moye, the songs and stories of Keith Eric and Shanta Nurullah, and the blues of Chicago Beaux. All programs are at 1:00pm and at 3:00pm on Saturdays and Sundays. For more information call Public Programs (312) 322-8854. This program is partially supported by the Kenneth and Harle Montgomery Fund and a CityArts II & IV grant from the Chicago Office of Fine Arts, Department of Cultural Affairs.

July & August Weekend Programs

Each Saturday and Sunday you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the *Weekend Programs* sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

July

11 1:30pm *Tibet Today* and *Bhutan* (slide lecture). See Lhasa and other towns now open to the public, as well as Bhutan, land of the Thunder Dragon.

12 12:00noon *Brontosaurus Story* (tour). A fascinating look at some of the newest discoveries about the "thunder lizard."
1:00pm *Fireballs and Shooting Stars: Keys to the Universe* (tour). Discover the origins, types, sizes, and importance of meteorites.

18 11:30am *Ancient Egypt* (tour). Explore the traditions of ancient Egypt from everyday life to myths and mummies.

25 1:30pm *Tibet Today* and *A Faith in Exile* (slide lecture). Investigate Lhasa and refugees in Dharmsala (home of the Dalai Lama), Darjeeling, and Sikkim.

August

1 11:30am *Ancient Egypt* (tour). Explore the traditions of ancient Egypt from everyday life to myths and mummies.

8 1:30pm *Tibet Today* and *Tour of Tibet* (slide lecture and tour). Tour through the Tibet exhibit after looking at Lhasa and other towns now open to the public.

These programs are free with museum admission and tickets are not required.

Field Museum of Natural History

Biennial Report

1985-1986

FROM THE CHAIRMAN

The years 1985-1986 have been significant ones for Field Museum of Natural History. During the past biennium, the Museum has taken two major steps into its future. With the completion and publication of our Centennial Directions study, we have clearly charted our programmatic course. To implement that course of action, we have undertaken to raise $40 million for capital and operating support. We expect that our capital campaign will be completed by the end of 1987.

In 1985 and 1986 we have set the stage for the Museum to continue its vital role as a center for basic research and public education. Now more than ever, we need to know more about the cultures and physical environments of our world. Field Museum is prepared to help us secure the knowledge we need in the years ahead. Our programmatic plans are bold. Our financial approach is conservative.

We are deeply indebted to the Museum's members for their support, to the 223 individuals who volunteered their time to make projects possible throughout the Museum, and to the 4,759 individual, corporate, and foundation donors who contributed their funds to finance these programs. In addition, we are grateful to the Chicago Park District, whose core base of support allows us to heat, light, and maintain a structure of nearly one million square feet. We are also thankful for the support of the Illinois State Museum Grant, Illinois Arts Council, Illinois Humanities Council, City of Chicago Office of Fine Arts, National Science Foundation, National Endowment for the Arts, National Endowment for the Humanities, and the Institute of Museum Services.

The varied contributions of many people and organizations are needed to assure that Field Museum of Natural History will serve even more effectively in the years ahead.

Sincerely yours,

Richard M. Jones

Richard M. Jones
Chairman

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Willard L. Boyd,
Staff Liaison

A dinosaur fashioned of wood serves as a progress indicator for the $40 million capital campaign, begun in May, 1986. As funds mounted, purple coloring advanced upward from the tail of the dinosaur, on view in Stanley Field Hall. Photo by Diane Alexander White 84395

TIME FUTURE FROM TIME PAST: The Campaign for Field Museum. *"There is a Chinese proverb which states 'To understand a man or a nation, you have to understand his or their memories.' Field Museum is filled not only with personal memories, but also with the memories of men and women stretching back to the dawn of time.*

"We at the MacArthur Foundation want to be effective partners in making Chicago a rich and rewarding place to live — for us, for our children, and for future generations. We want to help foster understanding of our roots, through preservation of the artifacts of the past, because we believe it is that process which holds the key to a better future. It is in this spirit that I am especially pleased to announce that the MacArthur Foundation is making a $2.5 million challenge grant to the Campaign for Field Museum." — James M. Furman, executive vice president of the John D. and Catherine T. MacArthur Foundation (May 15, 1986).

Throughout 1985 and 1986, Field Museum was deeply involved in the most ambitious fund-raising effort in its history. Launched in 1985, "TIME FUTURE FROM TIME PAST: The Campaign for Field Museum" seeks $40,000,000 in capital, endowment, programming, and operating support.

The success of TIME FUTURE FROM TIME PAST is directly attributable to the strong commitment to the Museum on the part of Chicago's civic, corporate, and philanthropic communities. In the early months of 1985

Richard M. Jones, chairman of the Board of Trustees and campaign chairman, enlisted other trustees and community leaders to chair specific divisions of the campaign: William L. Searle—chairman, Leadership Gifts Division; Thomas E. Donnelley II—vice chairman, Individual Leadership Gifts; Robert A. Pritzker—vice chairman, Corporate Leadership Gifts; Marshall Field—chairman, Board Fund Division; Mrs. T. Stanton Armour—chairman, Individuals Division; Leo F. Mullin—chairman, Corporate Division; Willard L. Boyd—chairman, Foundation Division; Theodore W. Van Zelst—chairman, Collectors Division.

Each of these individuals enlisted a group of interested Museum members and friends to assist in their efforts. In all, 225 dedicated individuals volunteered to help with the campaign. The divisions held organizational meetings throughout the year, and made early leadership solicitations prior to the official kick-off and public announcement of the campaign on May 15, 1986.

The Chicago Park District contributed $6,700,000 toward the Museum's restoration projects. In addition to the $2,500,000 from the John D. and Catherine T. MacArthur Foundation for endowed curatorships, many important leadership gifts helped set the pace for the campaign. Notable among these were $2,500,000 in unrestricted support from Mr. and Mrs. William L. Searle through the Searle Family Trust, $1,000,000 for the new Gem Hall and Gallery from Mr. and Mrs. David W. Grainger and the W.W. Grainger Foundation, and $1,000,000 for building restoration and exhibit renewal from The Robert R. McCormick Charitable Trust. Through the efforts of its many friends, by December 31, 1986 the Museum had raised over $32,000,000—more than 80 percent of its goal. A complete listing of donors to the campaign can be found on page 46.

The National Endowment for the Arts awarded the Field Museum a $500,000 challenge grant for endowment purposes. The grant recognizes the national importance of the Museum's anthropological collections. Endowment funds from the grant and corresponding matching funds campaign will enable Field Museum to ensure continued and proper care for these invaluable collections through research and conservation.

While the Development Office, under the direction of Vice President Thomas R. Sanders, devoted the greatest percentage of its energies toward the campaign during the biennium, the office undertook a variety of important activities of other sorts as well. The two-year period was marked by significant changes and growth in many areas.

Annual Fund and Planned Giving

Even with the capital campaign as top priority, the Annual Fund continued to provide vital operating support for the Museum. Many of the Museum's donors continued their unrestricted or restricted support in addition to their campaign contributions. Contributions from Chicago's corporate community has long been a steady, reliable source of funding support for the Museum. Many corporations have taken leadership roles in this area, pledging continuing operating support beyond their generous campaign gifts.

The Founders' Council, consisting of the Museum's principal individual, corporate, and foundation donors, continued to expand in size and scope of activities. Henry T. Chandler assumed the role of Founders' Council Chairman in September,1985; he succeeded Thomas J. Eyerman, who had provided strong leadership for the group since the fall of 1983. Membership in the council grew significantly over the period, from the initial 250 charter members in 1983 to 355 by the end of 1986—a dramatic 62 percent increase.

During 1985, the Founders' Council began an active schedule of programming which included special previews, receptions, and lectures by staff and distinguished visitors, and a luncheon/seminar series covering varied topics ranging from the unique holdings of the Mary W. Runnells Rare Book Room, to botanical and ornithological research in South America.The highlight of the Council's year was the inauguration of the first "Field Museum: Ambassador to the World" program. During the evening cosponsored with the Mid-America Committee, the Founders' Council presented its first "Ambassador to the World" award to their very special guest, His Excellency Fernando Belaunde Terry, former president of Peru.

In early 1986, Susan E. VandenBosch, after many years of ably assisting the Women's Board, assumed staff responsibilities for the Council and all individual giving. The "Luncheon in the Loop" seminar series, hosted by First National Bank, Commonwealth Edison, and Borg-Warner Corporation, brought material from Field Museum's collections and new results from field research to convenient lunch-time locations for Founders' Council members during 1986. At its annual dinner in September, the Council presented its "Award of Merit" to renowned naturalist/artist Dr. Roger Tory Peterson, author of the famous Peterson's Field Guides. The program for the evening highlighted the newly discovered cinnamon screech owl, *Otus Petersoni,* named by its discoverers (Field Museum Curator John W. Fitzpatrick and Research Associate Glen Woolfenden) in honor of Dr. Peterson.

The Planned Giving Program, under the direction of Clifford Buzard since its inception in 1981, continues to work with interested members and donors in arranging for bequests or deferred gifts through the Field Museum Pooled Income Fund, charitable remainder annuity trusts, unitrusts, and life insurance.

Sponsored Programs

The biennium was a period of change and growth in the Sponsored Programs Office. Established late in 1983 as the Grants Office, the office was expanded and renamed in early 1985 based on the success of its initial efforts and the larger role it took on for proposal development and prospect research. Glenn S. Paré, who had been the Museum's Grants Officer, assumed the position of director of the office following the restructuring.

Sponsored Programs coordinates all grant re-

The Field Museum Women's Board hosted its annual Family Christmas Tea in December of 1985 and 1986. Shown here (l. to r.) are the 1986 Tea chairman, Mrs. James J. Glasser, Women's Board President Mrs. Malcolm N. Smith, and Tea co-chairman Mrs. Harrington Bischof.

Photo by Diane Alexander White 84646

quests emanating from the Museum and is the Museum's chief liaison with government agencies and philanthropic foundations. In addition to providing the majority of proposals and written reports for the campaign, Sponsored Programs worked closely with the scientific and programmatic staff to develop funding and grant support for research projects, collection care, and programming efforts museumwide.

The Museum has achieved a high level of success in this effort, even during the period of sharp government cutbacks; operating and restricted grant support from federal and state sources approached $3,000,000—representing a notable increase in grant support over the prior period. Grant support for projects and programs from philanthropic foundations increased significantly during the period as well.

Membership

Field Museum has long enjoyed the support of many friends through Membership. Although escalating operating costs mandated increases in membership dues during 1985, most Members continued their strong support of the Museum through dues.

In 1985, Marilyn E. Cahill assumed the management for the Department of Membership, which offered a wide range of activities for Museum Members during 1985 and 1986. Over 2,000 Members previewed the special exhibit, "The Art of Cameroon," on March 8, 1985; and the 5,215 Members who attended the special preview of "Te Maori; Maori Art from New Zealand Collections" were delighted by the enchanting songs and performances of the Museum's Maori guests. Members also enjoyed special previews of newly opened permanent exhibits at the Museum, including a two-day preview of the newly opened Grainger Hall of Gems in November, 1985 and the evening preview of "Gods, Spirits, and People: The Human Image in Traditional Art" on November 21, 1986.

More than 10,000 Members attended the popular Members' Nights held annually in May. In 1985, in addition to viewing the collections and research areas closed to the public, Members were entertained by the Chicago Lion Dancers and the Susie Hanson Orchestra. In 1986, the evening's entertainment included the Mexican Folkloric Dancers, Wesoly Lud Polish Folk Dancers, and the Absolute Music string quartet.

The Women's Board

The biennium was a lively and exciting period for the Women's Board. On November 1, 1985, the Women's Board sponsored one of the most spectacular events of the social season, the gala Gem Ball. The dazzling evening celebrated the opening of the newly renovated Grainger Hall of Gems. Co-chaired by Mrs. Gerald S. Gidwitz and Mrs. Edward Byron Smith, Jr., the affair was especially impressive; Field Museum's own permanent collections of gems were augmented by outstanding pieces on loan from the Smithsonian Institution and complemented by a fabulous display by Harry Winston, Inc. of "Rare Jewels of the World." Over 1,000 people attended the ball.

The splendor of the Gem Ball was perhaps matched only by the November 7, 1986 Treasures Ball. The very special event, planned especially by and for the Women's Board, highlighted rare and exotic pieces from Field Museum's permanent collections. Mrs. Robert C. Ferris served as chairman of the committee. Special exhibits of unique specimens and artifacts seldom seen in public were displayed for the evening of the ball only.

The highlight of the biennium for the Women's Board was the annual meeting in July, 1986. At that meeting, The Women's Board celebrated twenty years of service to Field Museum—renewing its commitment of support in the spirit of its founder, Mrs. Hermon Dunlap Smith. At that meeting, Mrs. Philip D. Block III completed her term of office as president, and was feted for her hard work and leadership into the Women's Board's third decade. She was succeeded as Women's Board president by Mrs. Malcolm N. Smith.

Tours and Special Events

Field Museum's Tour Program, coordinated by Dorothy S. Roder, sponsored 18 separate trips during the biennium. All of the guided tours offered through the Museum are intended as both enjoyable and educational. The trips feature active itineraries of scientific and cultural note, and are led by scholars or scientists —primarily Field Museum curators—who specialize in one of the Museum's disciplines or have a particular familiarity with the region visited.

Trips around the United States during the period included rafting through the Grand Canyon, sailing aboard the *Nantucket Clipper* through the Colonial South, birdwatching during the migration period along the upper Texas coast and Rio Grande Valley, an Alaskan trip including the Pribilof Islands, and a weekend "birding" excursion to Wisconsin's Horicon Marsh and the Crane Foundation. Trips abroad involved touring through China and Tibet, visiting ancient sites in Egypt, whale watching in Baja, sailing to the great Mayan ruins of Yucatan, cruising through Norway's magnificent fjords, taking a safari in Kenya, and discovering art and culture of Indonesia.

One special tour, to New Zealand in April-May, 1986, was arranged to correspond to the Museum's hosting of the special exhibit "Te Maori." Tour participants were guests of the Museum during the ceremonies opening and closing the exhibit, and became close friends with the Maori people. The group has remained active within the Museum and on November 20, 1986, the group spent the night sleeping within the Maori House at the Museum.

The Collectors' Committee, established under the capital campaign, was also active during the period. In 1985, the group previewed "The Art of Cameroon" exhibit and were treated to a special presentation by visiting curator Tamara Northern. In November, 1986, the Collector's Committee also previewed the new installation from Field Museum's anthropological collection, "Gods, Spirits, and People."

Dance headgear of the Ekpo Society, men's secret society of the Ibibio Tribe, Nigeria, on view in the exhibit "Gods, Spirits, and People," which opened November 22, 1986. Gift of Calvin S. Smith (1915). Cat. 25038. Photo by Ron Testa 109452

COLLECTIONS and RESEARCH

ANTHROPOLOGY

Curators. Bennet Bronson, associate curator of Asian Archaeology and Ethnology, continued his laboratory, library, and field research on preindustrial metallurgy in Asia, resulting in articles on the history of iron in Thailand, early steel production in China, and crucible steel processes in India, plus a short book (with P. Charoenwongsa as junior author) titled *Eyewitness Accounts of Early Mining and Metallurgy in Mainland Southeast Asia.* Related research on early trade patterns in the Indian Ocean area has yielded two published articles thus far. His current fieldwork, carried out in collaboration with and funded by the Fine Arts Department of the Thai government, includes survey and excavation at protohistoric commercial/industrial sites in southern and western Thailand. He has also just finished a privately funded pilot ethnographic study of traditional iron smelting in Luzon, conducted jointly with staff of the National Museum of the Philippines.

Glen Cole, curator of Prehistory and department chair through June 1986, finished study and preparation for publication (Bahn, Paul G. and Cole, G. H., 1986, La Prehistoire Pyreneenne aux Etats-Unis, *Bulletin de la Societe Prehistorique Ariege-Pyrenees* 41:95-149.) of Upper Paleolithic materials in Field Museum's collections from the Pyrenees area of southern France. This work was done in collaboration with Dr. Paul Bahn of Hull, England, a specialist in the prehistory of the Pyrenees area. With that project completed, Cole began preparing a symposium presentation based on fieldwork and museum studies of prehistoric artifactual materials from the Sango Hills and neighboring areas of southern Uganda. Also, a grant proposal was prepared for submission to the National Science Foundation's program for "Support for Systematic Anthropological Collections" to provide support for completion of cataloging of a large collection of Middle Stone Age artifacts from the Nelson Bay Cave on the southern African coast.

Phillip H. Lewis, curator of Primitive Art and Melanesian Ethnology, continued research on settlement patterns and social change in New Ireland. The research covers a 53-year period beginning with the work of anthropologist Hortense Powdermaker. Powdermaker conducted fieldwork at Lossu Village in 1929 and published *Life in Lesu* in 1933. Lewis conducted fieldwork at Losau Village in 1953-54, 1970, and 1981. Both anthropologists mapped the village settlement patterns and recorded census figures. Lewis's research involves tracking the changes in settlement patterns and population and the effects these had on memorial ceremonies called *malanggan.* He is also studying the impact of the settlement and population changes on the painted, carved images made for the memorial ceremonies.

In 1985 John Terrell, curator of Oceanic Archaeology and Ethnology, and department chairman since July 1986, served on the Museum's negotiating team that succeeded in bringing the major exhibition "Te Maori: Maori Art from New Zealand Collections" to Chicago during March-June 1986. Twice Fulbright Fellow to New Zealand (1965, 1981), Terrell's intimate knowledge of the Pacific gained over the last twenty years proved instrumental both in convincing the Maori to allow their cultural treasures to visit Chicago and in helping Museum staff welcome the Maori themselves when they came to Chicago in March 1986 for the opening of "Te Maori." In April 1986 Terrell led a delegation of Museum members to Tokomaru Bay on the North Island of New Zealand: the original locale where the Museum's Maori meeting house *Ruatepupuke II* once stood. This cultural mission was warmly received by the people of Tokomaru Bay and has helped cement the partnership between the Maori and the Museum initiated by the "Te Maori" exhibition. Thereafter, Terrell went on to the Fiji Islands to lay the foundations for a new field research program to study that important ethnic crossroads in the central Pacific. His book *Prehistory in the Pacific Islands* was published by Cambridge University Press in April 1986 and has since been heralded by reviewers in the scientific press as a "stimulating and critical assessment" (*New Scientist*) that is "a must for every scholar of Pacific prehistory" (*Science*).

James VanStone, curator of North American Ethnology and Archaeology, conducted fieldwork in Paugvik Village, Alaska, with Dr. Donald E. Dumond of the University of Oregon. The Paugvik site is believed to be one of the major native villages in the Naknek River region during the period of local control by Russian traders and missionaries (1818-67). Three large house pits were excavated, two more partially excavated, and four trenches were dug through the extensive midden deposit. Twenty-six boxes of excavated materials were shipped to Field Museum for analysis. In addition to excavations, the precise boundaries of the site were determined and the entire area of occupation mapped. VanStone also completed and published a monograph on contemporary Athapaskan material culture *(Fieldiana: Anthropology,* n.s. no. 10). His study of southwestern Chippewa material culture in the Museum's collections is near completion as is a similar study of the technology of Nunivak Island Eskimos. VanStone also had an edited translation of two 19th-century Russian travel journals in southwest Alaska accepted for publication by the University of Alaska Library.

Research Associates. Robert A. Feldman, visiting assistant curator (1985) and research associate (1986), continued archaeological fieldwork in Peru. With the assistance of Peruvian students from Cuzco and Arequipa and of personnel of the Southern Peru Copper Corporation, he conducted excavations at a cemetary (*ca.* A.D. 1200) on the Pacific coast north of Ilo, in far southern Peru. Pottery from this site shows a transition between two local styles: the earlier Chiribaya style and the late pre-Inca Estuquiña style. Feldman assisted in excavations directed by Dr. James Richardson III of the Carnegie Museum of Natural History in Pittsburgh at Ring Site, an 11,000-year-old shell midden located on the coast south of Ilo. And he conducted a limited site

World renowned paleoanthropologist Donald Johanson (center), guest of the Founders' Council, lectured on ancient man to a standing-room-only audience on March 23, 1985. With him are Reception Chairman Henry T. Chandler (left) and Founders' Council Chairman Thomas J. Eyerman. Photo by Diane Alexander White 83893

survey around Cerro Baul, a flat-topped mesa that is the location of an important intrusive outpost of the Wari empire (*ca* A.D. 700). Feldman continues analysis of artifacts from 1985 and earlier excavations in Moquegua, Peru, and has submitted two articles for publication, one in the U.S. and one in Peru.

David S. Reese, research associate (in residence) in archeozoology and paleomalacology, has been analyzing Field Museum archaeological bone and shell collections from Paugvik (Alaska), Hopewell (Ohio), and Kish (Iraq) in preparation for publication. He is also studying bone and shell collections from archaeological sites in Tunisia, Egypt, Lebanon, Cyprus, Greece, and Italy and shells from sites in Libya, Turkey, Syria, and Iran.

Reese presented papers at the University of Virginia, a conference on Pompeii in Washington, DC, and at a shell bead conference in Rochester, New York. In 1985 and 1986 he conducted fieldwork at various archaeological sites in Italy, Greece, and Cyprus.

Robert L. Welsch, research associate (in residence) in Oceanic and Southeast Asian Ethnology, returned from Indonesia after 16 months of field research among the Mandar people of South Sulawesi. During his stay in Indonesia, he collected about 500 Mandar specimens for Field Museum's collections, including a collection of nearly 100 silk sarongs, three back-tension looms, and many other samples of Mandar textile motifs as well as smaller collections of baskets, knives, ceramics, and other specimens. This collection of textiles is the largest in the world outside Indonesia and represents nearly all of the traditional motifs and many newer ones.

Collections Management. From September 1985 through 1986 Lyle Konigsberg was emloyed as a physical anthropologist under a National Science Foundation grant. Konigsberg, a Ph.D. candidate in anthropology at Northwestern University, was responsible for inventory, redistribution, and storage of human skeltons.

During the inventory a considerable number of human bones were identified and assigned to their correct locations. Detailed summaries of provenience, age-at-death, sex, bones present, pathologies, associated material, and problems with the cataloging were collected on standardized forms. These data were later entered into a microcomputer database and used to generate a new storeroom catalog as well as identify the correct locations for some misplaced bones. Because of the large size of the collection (3,964 crania alone were enumerated), the microcomputer files were later uploaded to the Museum's mainframe computer.

A 1985 Institute of Museum Services grant enabled Christine Danziger, conservator, and Kathleen Christon, technical assistant, to clean, conserve, relabel, and properly store some 1,000 Peruvian Central Coast textiles. The project was directed at textiles accessioned from the 1890s-1930s, and was a continuation of interest in and conservation of South American textiles. Earlier conservation projects involved 600 textiles from Chile and South Central Peru.

In 1986 the National Science Foundation awarded the Anthropology Department $153,800 for the "Support of New Collection Storage Facility for Pacific Southeast Asian and African Collections." Construction of the storage facility should be completed in late 1987.

In November 1986 Janet Miller was appointed departmental archivist and registrar. Miller's background is in art history and archival management, having received an M.A. in art history from the American University (1978) and an M.S. in archival administration from Columbia University (1986). She will be responsible for all facets of information management on the departmental level.

Among the noteworthy gifts of 1985 and 1986 were 1,255 Japanese objects, including masks, books, prints, sculpture, and carvings from Katharine and the late Commander G. E. Boone of Monmouth, Illinois and 180 Japanese inro with ojime and netsuke from Mr. and Mrs. Carl A. Kroch, of Chicago.

BOTANY

The research effort in the Department of Botany continued at a steady pace as reflected in the numerous staff publications (see page 37). A large part of research in Botany is concerned with the rich flora of the American tropics, which is fast disappearing as forests are cleared for human settlement and economic development. During the biennium, staff members participated in collecting expeditions to a number of areas of tropical America, including Brazil, northern Chile, Peru, Ecuador, Panama, and Costa Rica.

William Burger neared completion of his intensive study of the Lauraceae Family for the *Flora of Costa Rica* project. The classification of this large and economically important but taxonomically difficult family of tropical trees has long presented a major challenge to botanists. Michael Dillon continued to pursue his studies of the sunflower family (Compositae), with special emphasis on the Andean and Peruvian species. He completed a treatment of the large tribe Inuleae for the ongoing *Flora of Peru*. He also continued his work on the biogeography and evolution of the *lomas* formations in the coastal deserts of Peru and Chile, and he initiated a survey of a relict forest in the upper Río Zaña in northwestern Peru. Timothy Plowman continued his work on the ethnobotany of the coca plant and his taxonomic studies of this family (Erythroxylaceae), concentrating on the numerous species of the Amazon Basin and eastern Brazil. In collaboration with a group of anthropologists and botanists, he completed a comprehensive study of the native Andean uses of plants in Chinchero, near Cuzco, Peru. Dr. Plowman was selected as the new chair of the Department of Botany, succeeding William Burger.

John Engel (with R. M. Schuster of the University of Massachusetts) completed the second part of a major

The new Grainger Hall of Gems opened November 5, 1985. Photo by Ron Testa and Sonia Fonseca 84170

monograph of the liverwort family Schistochilaceae, making that family the best known of any group of Hepaticae. He is proceeding with monographic studies in other liverwort groups of the Southern Hemisphere, especially Tasmania and New Zealand. Patricio Ponce de Leon continued to work on the puffballs and earth star fungi (Gasteromycetes), then retired at the end of 1985. In August, 1985, Gregory Mueller joined the staff from University of Washington as assistant curator in Mycology. He concluded his work on the North Temperate species of *Laccaria* (Laccariaceae) and began a long-term project on the biology and taxonomy of the Central and South American species of this large group of mushrooms. He also aided local physicians in identifying mushrooms in cases of suspected poisoning. Robert Stolze, collection manager for pteridophytes, completed his study of the Asplenioideae (Polypodiaceae) for the *Flora of Ecuador* and began an ambitious, five-year project to prepare an account of all the ferns and fern allies of Peru. This study, undertaken jointly with Prof. Rolla Tryon of Harvard University, is expected to include nearly 1,000 species and will be the first modern pteridophyte flora for an Andean region.

A number of visiting assistant curators augmented our regular staff during 1985-86. Kerry Barringer continued his work on Orchidaceae and Scrophulariaceae for the *Flora of Costa Rica* project and also completed treatments of several small families for the *Flora of Veracruz*. Sylvia Feuer-Forster proceeded with her detailed studies of pollen morphology and evolution of the mistletoe (Loranthaceae) and protea (Proteaceae) families. Nancy Garwood, based in Panama, initiated a four-year project to prepare an illustrated manual of seedlings of the Panamanian rain forest, with special emphasis on Barro Colorado Island. Michael Huft, of the Missouri Botanical Garden, continued to be stationed at Field Museum in connection with his work on the *Flora Mesoamericana* project. He completed treatments of several groups for this project, including Eriocaulaceae, Loganiaceae and *Smilax* (Liliaceae), as well as the large family Euphorbiaceae for the *Flora of Nicaragua*.

Our collections also saw growth and activity during 1985-86. In 1986, Honora Murphy joined our staff from the Missouri Botanical Garden as collections manager, and she made great strides in reorganizing the collections, reducing the backlog of unmounted specimens, and generally improving the level of specimen care and usefulness. Botany has one of the most active loan programs in the Museum, as we strive to make our collections available to researchers worldwide. During this period. we sent out 464 loans that included more than 50,000 herbarium specimens. Our loan program alone occupies four staff members nearly full-time. During this same period, we took in more than 86,000 new specimens through exchanges, gifts, purchases, and Museum expeditions. This is more than twice the number of specimens that were received during the previous biennium and reflects in part a substantial increase in activity among botanists collecting in the tropics. More and more our staff are involved in the identification of specimens, particularly from the tropics. This time-consuming work is not only a vital service to our colleagues but also attracts significant numbers of new specimens for the collections.

In June, 1986, the Museum honored Rolf Singer, research associate in Mycology, with a testimonial dinner in appreciation of his many years of outstanding service to science and to Field Museum, an event which coincided with his 80th birthday. Rolf Singer's contributions to the classification of fungi are exemplified by the 1986 publication of a fourth, fully revised edition of his monumental work *The Agaricales in Modern Taxonomy*.

GEOLOGY

The Department of Geology was involved in a wide range of research, collecting, and public-program activities. Ms. Mary Carman was hired as the collections manager of Fossil Invertebrates and Paleobotany. She soon added fossil vertebrates to her purview, becoming collections manager, Paleontology. Department members were notably footloose during this period, and several curators did research abroad for extended periods. Published research covered meteoritics, metamorphic petrology, fossil vertebrates and invertebrates, and fossil plants. All areas of departmental collections experienced some growth, which was especially significant in fossil invertebrates, fishes, and amphibians. Department members made numerous contributions to the Museum's public programs. In particular, Curator Edward Olsen and Dorothy Eatough (collections manager, Mineralogy/Petrology) were heavily involved in production of the new Grainger Hall of Gems, and in planning the forthcoming (1987) Tiffany exhibit. Peter Crane, Matthew Nitecki, and Bertram Woodland led Museum tours to England, the Grand Canyon, and northern Norway and Spitsbergen, respectively.

Invertebrate Paleontology and Paleobotany. Scott Lidgard, assistant curator of Fossil Invertebrates, pursued research on colony evolution and biogeography of bryozoans ("moss animals"). Scott spent six months at the British Museum (Natural History) as a NATO Postdoctoral Fellow. Matthew Nitecki, curator of Fossil Invertebrates, continued his research on the evolution,morphology, and systematics of Lower Paleozoic algae. Following his return from an extended research trip to the Soviet Academy of Sciences, he spent nine months in Oslo, Norway as a Fulbright Fellow. In the midst of these activities, Nitecki continued as the organizer of the very successful Spring Systematics Symposia at Field Museum, which as in past years were supported by National Science Foundation (NSF) grants to him. Symposium topics were "Neutral Models in Evolutionary Biology" (1985) and "Evolution of Human Hunting" (1986). Peter Crane, associate curator of Fossil Plants, completed papers on fossil plant remains

Guests at the Members' Preview of "The Art of Cameroon" exhibit (March 8-June 16, 1985) included Harold Washington (with book), mayor of Chicago. To Mr. Washington's right is Dr. Tamara Northern, curator of ethnographics at Dartmouth College, who also served as curator of the exhibit. Photo by Diane Alexander White.

of Cretaceous and early Tertiary age from localities worldwide. These studies include descriptions and discussion of very early (Lower Cretaceous) flowers, which provide important data regarding the evolution of flowering plants, and NSF-supported studies on the evolution of the birches. Peter Crane may win the Department of Geology's Peripatetic Scholar Award for this period; among other travels, he made research and lecture trips to the University of Århus (Denmark), University of Göttingen (W. Germany), Halle (E. Germany), Montpellier (France), and the British Museum, plus a collecting expedition to north Texas. He served as co-editor of the journal *Paleobiology*, and as associate editor of several other scientific journals. In 1985, Peter Crane was named one of 10 "Outstanding Young Citizens" by the Chicago Junior Association of Commerce and Industry.

Vertebrate Paleontology. John Bolt, associate curator of Fossil Reptiles and Amphibians and department chairman, continued research on evolution of the tetrapod auditory system. He and a colleague from the University of Chicago presented a paper at a conference on the evolution of the amphibian ear, at Bielefeld (W. Germany). In 1985, Bolt began a new project—collecting very early fossil amphibian material at a newly discovered locality in the Mississippian of Iowa, working with the Iowa Geological Survey Bureau. In 1986, he spent three months at the site with a crew, under a grant from the National Geographic Society. By the end of the summer, some 100 drawers of specimens had been recovered. This (very rare) material represents the oldest well-preserved and abundant tetrapod fauna ever found in continental North America, and will make an important contribution to our knowledge of the early history of land-living vertebrates. Lance Grande, assistant curator of Fossil Fish, continued his very successful program of research and collecting in the famous Eocene Green River deposits of Wyoming. Thanks to his efforts, Field Museum now has the finest collection in the world of this spectacularly preserved material. Lance also began a research and collecting program involving a recently discovered Cretaceous fish locality in southern Mexico, with David Bardack, a research associate of the Department of Geology who is a professor of biology at the University of Illinois, Chicago. Their work is supported by a grant from the National Science Foundation. Under a separate NSF grant, Grande is continuing to reorganize the fossil fish collection. In addition to Grande's collecting activities, this collection has been augmented during the past two years by important donations of excellent Cretaceous fish specimens from northeastern Brazil. Grande has also spent considerable time on public programs, where his activities have included work on a new Eocene hall that will include many fossil fish specimens. He was recently appointed an associate editor of the *Journal of Vertebrate Paleontology*. William Turnbull, curator of Fossil Mammals, continued his research on Eocene mammals from the Washakie Basin of Wyoming and on Australian fossil marsupials. The Australian work has been carried out jointly with one of the department's research associates, Ernest Lundelius of the University of Texas. In 1985, Turnbull spent three weeks in China as part of his work on Eocene mammals. The trip included fieldwork, as well as study in the collections of the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing.

Meteoritics, Mineralogy, and Petrology. Edward Olsen, curator of Mineralogy, was involved in a number of meteorite-related and geochemical studies. These included investigation of the possibility that some meteorite samples actually come from Mars, and a study of the distribution of uranium isotopes in the Earth's crust. The uranium-isotope studies, being pursued with a colleague from Argonne National Laboratory, may have a major impact on dating techniques, because they question some of the fundamental assumptions on which certain isotope-dating techniques are based. Olsen has also been studying (with George McGhee, a Department of Geology research associate from Rutgers University), the possibility of a major extinction due to asteroid impact in the late Devonian. He became an associate editor of the journal *Geochemica et Cosmochemica Acta* in 1985. In 1985, he was appointed chairman of the Nomenclature Committee of the Meteoritical Society. As mentioned above, Olsen has had major involvement in public programs in this period. Bertram Woodland, curator of Igneous and Metamorphic Petrology, pursued studies on texture of low-grade metamorphic rocks, including samples from Arkansas and from Cornwall, England. A separate project was study of possible tidal laminations in sediments from the Middle Pennsylvanian of Illinois. This reflected Woodland's continuing interest in the formation of the famous Mazon Creek fossil deposits, of which the Museum has a large and important collection. Woodland's involvement in public programs included leadership of a tour to northern Norway and Spitsbergen.

David Lewis (rt.), shown with Gregory M. Mueller, assistant curator of mycology, gave Field Museum his collection of some 4,000 fungi, one of the finest collections of such material from east Texas. Such gifts of specimens from private collectors contribute immeasurably to the Field Museum's holdings, and are a valued source of continued growth.

COLLECTIONS and RESEARCH

ZOOLOGY

The Department of Zoology is the largest of the Museum's four curatorial departments and consists of six divisions: Amphibians and Reptiles, Birds, Fishes, Insects, Invertebrates, and Mammals, staffed by twelve curators, six collection managers, and support personnel in various technical and nontechnical positions. The department changed markedly during the 1985-86 biennium with the appointment of two assistant curators, and looks forward to the appointment of two new curators in 1987.

Amphibians and Reptiles. Harold Voris studied sea snake populations in Malaya and Borneo. He also studied aspects of the biology of sea snakes and developed procedures for marking live sea snakes, thus solving a major problem in ecological studies of this group. Robert Inger continued an ecological analysis of frogs of Southeast Asia and Borneo. He also completed a key to the frogs of Sarawak and studies on paternal care in Sarawak frog species. Hymen Marx completed (with James Ashe) studies of the phylogeny of vipers. Research Associate Sharon Emerson studied the biomechanics and development of frog pectoral girdle morphology—work supported by a National Science Foundation grant. In addition, the division appointed two new field associates, Bruce Jayne and Robert Steubing.

Birds. John Fitzpatrick was promoted to curator and elected chairman of the Zoology Department. Despite the added administrative responsibilities, John completed fieldwork for the large-scale inventory and analysis of bird communities in the Andean foothills, and made significant scientific contributions with his study of Florida scrub jay social systems. In recognition of these contributions, John and Research Associate Glen Woolfenden were awarded the Brewster Medal in 1985, the highest honor bestowed by the American Ornithologists' Union. Also in 1985, Scott Lanyon joined the staff as assistant curator and head of the division. Scott received his Ph.D. in May 1985 from Louisiana State University for his work on biochemical systematics of the Tyrannoidea. Since arriving at Field Museum, Scott has established a collection of frozen tissues to provide the material necessary for biochemical investigations of avian evolutionary history, and began a study of the evolutionary relationships within the New World blackbirds (Icterinae). David Willard continued his long-term study of measurements of spring versus fall migrant birds salvaged from the Chicago area. David has also been coordinating the publication of a survey of the avifauna of Venezuela's Cerro de la Neblina jointly conducted in 1984 and 1985 by Field Museum, the Smithsonian Institution, and the American Museum of Natural History. Finally, the division is proud to announce the appointment of two new field associates, Manuel Plenge and Barbara Clauson; and three research associates, Peter Ames, William Beecher, and Debra Moskovits.

Fishes. Robert Johnson continued his studies on the shore fishes of Belize and Honduras. As the result of Johnson's collecting expedition in Central America, Field Museum now houses the largest and most diverse collection of Caribbean fishes from Central America in the country. Johnson also received an NSF grant to collect and study reef fishes from Cuba. In 1986 he resigned his position as curator of Fishes to join the faculty at the College of Charleston. During 1985 and 1986, the division renovated its entire collection in terms of maintenance of specimens, housing of specimens, reorganization of its type collection, updating nomenclature, and building new collection management facilities and offices. The collection is now more accessible and workable for visiting scientists; it also provides well equipped modern office facilities for students and visitors. Cataloged data were entered into the division's computer system for its type and tank collections. A database system was developed for these two collections by Terry Grande and the results were presented at the American Society of Ichthyologists and Herpetologists meeting last year. Grande also worked with other collection managers of major museums throughout the country in setting up a computer-based networking system that can interface and exchange specimen information with all museums, thus eliminating the need for invoices and paperwork. The division appointed John Clay Bruner as associate and Myriam Ibarra and Donald Stewart as research associates.

Insects. James S. Ashe began a three-year study supported by a grant from the NSF on the systematics, evolution, and fungus host relationships of bolitocharine staphylinids ("rove beetles") and began a collaborative project (with mammalogist R. M. Timm) on the evolution and ecology of amblyopinine staphylinids that are supposedly parasitic on mammals. Ashe conducted extensive fieldwork in the United States and Costa Rica in connection with both projects. He also completed and published a monograph on phylogenetic relationships of larvae of gyrophaenine staphylinids, as well as several smaller articles on Staphylinidae (with H. Marx) on the phylogeny of viperine snakes. John Kethley continued comparative developmental studies on prostigmatid soil mites with an emphasis on taxa found only in nutrient-poor ecosystems such as very sandy soils. Kethley also refined flotation techniques to collect the inactive stages of soil microarthropods and found (in a joint study with D. E. Walter and J. Moore, Colorado State University) the flotation procedure to be considerably more effective than procedures traditionally employed by soil ecologists. Alfred Newton and Research Associate Margaret Thayer continued their long-term study of the systematics and biogeography of the poorly known staphylinoid beetle fauna of the Southern Hemisphere, and their first large publication on this subject apeared in 1985. They completed ten weeks of fieldwork in New Zealand in early 1985, collecting over 158,000 specimens of Staphylinoidea and began a similar survey of southeastern Australia in late 1986. Newton continued studies on the higher classification and evolution of Staphylinoidea, including completion of a world generic catalog of the large family Pselaphidae (with D. S. Chand-

A fossil fish specimen intrigues a guest at the Treasures Ball, November 7, 1986, sponsored by the Museum Women's Board. Photo by Diane Alexander White 84604-2

ler). Thayer published papers on two unusual North American species of Staphylinidae and continued work on the systematics and phylogeny of the subfamily Omaliinae. The division appointed research associates Warren Atyeo and Margaret Thayer.

Invertebrates. Alan Solem published Part V of his *Camaenid Land Snails from Western and central Australia,* thus completing survey of the Kimberley camaenids; a report on *Simultaneous Character Convergence and Divergence in Western Australian Land Snails* in the Biological Journal of the Linnean Society of London; a report coauthored with F. M. Climo on *Structure and Habitat Correlations of Sympatric New Zealand Land Snail Species* in Malacologica; and a review article *Origin and diversification of pulmonate land snails* in an Academic Press Symposium volume. In new research, Solem completed a 314-page review of *Non-camaenid Land snails of the Kimberley and Northern Territory, Australia* for the Australian Journal of Zoology and has nearly completed a several-hundred-page monographic review of the South Australian camaenid land snails. His long-range project of inventorying and describing the major land snail groups of Western and central Australia is nearly complete and the intellectual challenge of interpreting their biogeographical and evolutionary patterns is underway. Use of a computer mapping program to summarize and interpret distributions is accelerating this process. Solem chaired the Curator's Colloquium and spoke at the Introduced Molluscs Symposium at the 9th International Malacological Congress, Edinburgh in September 1986.

Mammals. Bruce Patterson continued work on the morphology and distribution of small mammals in North and South America. He conducted a faunal survey in western Brazil in 1986 and gathered further data in the western U.S. in 1985 for studies on the evolution of chipmunks. The book *Island Biogeography of Mammals,* which he co-edited, was published in 1986 by Academic Press. Robert Timm also made collections in the western U.S. in 1985 for studies on gophers and ground squirrels and led fieldwork in Costa Rica in 1986. His research topics include ecology and systematics of Neotropical bats and the ecology and distribution of a group of beetles which are parasitic on Central and South American rodents. In 1986 he resigned his position as associate curator of Mammals and head of the Division of Mammals to join the faculty at the University of Kansas.

SCIENTIFIC SUPPORT SERVICES

Scientific Support Services includes the scientific computing, the scanning electron microscope, scientific illustration, the histological and biochemical laboratories, and Field Museum Press.

During 1985-86 computing at Field Museum underwent a number of changes. In the fall of 1985 the ancient PDP 11/40, supporting 8 users, was replaced by a VAX 11/750, supporting 40 users. The new machine is used principally to manage the substantial collection data bases, but also to support research and administrative functions. In late fall of 1986 the Museum was awarded a substantial grant from the National Science Foundation to improve research and collections computing facilities by way of an additional CPU, a larger disk capacity for the expanding collection data, a tape drive, printers, and terminals. Provision was also made for better communication between devices such as terminals, printers, and personal computers via a local area network or similar system. When the new CPU is purchased, the VAX 11/750 will be used for administrative functions such as a development data base, currently undergoing testing, and a new financial accounting system that will be selected in the future. The Computing staff consisted of Rosetta Arrigo, system manager, and James Koeppl, system specialist.

Chris Niezgoda of the Botany Department, with the help of consultant Ron Wibel from the University of Illinois, continued to coordinate the use of the scanning electron microscope for the benefit of all scientific staff. Plans are being made to find funds for the purchase of a badly needed new microscope.

The Museum's scientific illustrators produce high quality illustrations to be used by the curatorial staff in a wide range of research publications. Illustrators work closely with scientists to develop illustrations that can best depict the subject matter, whether it be a specimen or a process. Subject matter is as diverse as the world of natural history and includes new species of plants and animals, anthropological specimens, and reconstructions of extinct life forms. Illustrators also maintain contact with other illustrators and with printers in order to keep abreast of new materials, techniques, and printing processes. Cooperation with the managing editor of Field Museum Press, where many illustrations are published, has also proven essential.

Scott Lanyon, assistant curator of Birds, coordinated use of the biochemical laboratories during the biennium. As part of a preliminary investigation of the evolutionary relationships within blackbirds (Icteridae), Dr. Lanyon used horizontal starch gel electrophoresis to analyze frozen tissue samples from eight blackbird species collected in Peru during 1985 fieldwork. Notification of National Science Foundation funding to continue this study, including further analyses in the biochemical laboratories, was received in 1986. Some renovation and upgrade of the laboratories is in progress, including purchase of a new ultra-cold freezer and high-speed centrifuge.

Fieldiana, Field Museum's research journal, pub-

Gifts to the Museum Library during the biennium included (left) An epitome of the natural history of the insects of China *(1798), by Edward Donovan, from the William Elfenbaum estate; (top) a first edition, first issue copy of Darwin's* On the Origin of Species *(1859), from Mr. and Mrs. John Runnells; and (right) 35 original watercolors of baby birds by George Sutton, from the Brooks and Hope B. McCormick Foundation.* Photo by Ron Testa. 84792

lished 15 titles (4 in Anthropology, 2 in Botany, 1 in Geology, and 8 in Zoology) comprising a total of 1,235 pages. Field Museum Press also reprinted two *Fieldiana: Botany* volumes on the important legume family of plants, from the series "Flora of Peru" and "Flora of Guatemala" originally published in 1943 and 1946, respectively. The staff of Field Museum Press consisted of Timothy C. Plowman, chair of the Department of Botany, scientific editor; James W. VanStone, curator of North American archaeology and ethnology, associate editor; and Tanisse R. Bezin, managing editor.

THE LIBRARY

In 1985-86 over 5,500 volumes were added to the Library collections through a variety of means, including the international publications exchange program, the U.S. Depository System, gift, and purchase. Regular acquisition funds were supplemented as in former years through endowed acquisition funds given by Louis A. and Frances B. Wagner, Mr. and Mrs. Walter Cherry, and Mrs. Chester Tripp. These funds have continued to strengthen the Library resources that are indispensable to the Museum's scientific research programs. The volumes held in the General, Departmental and Divisional Libraries now total 230,000, exclusive of numerous special collections.

The Library extends its services to the public as a non-circulating research collection and during this period more than 1,700 visitors to the public Reading Room made use of over 9,000 volumes. The Library's highly specialized collections continued to be made available to the wider scholarly community through the Interlibrary Loan system, with over 1,300 loans and photocopies of Library materials supplied to libraries throughout North America for use by their patrons. The majority of these loans were initiated through OCLC (Online Computer Library Center), a computerized bibliographic network with 6,000 member libraries nationwide.

During 1986 the librarians and archivists of the members of The Associated Natural Sciences Institutions (TANSI) met on several occasions in the course of a grant-funded study of the archival collections held in these institutions. The TANSI librarians have subsequently established an informal network to investigate cooperative activities and to maintain communications among our group of highly specialized libraries.

Additions to the Rare Book Collections during this period began dramatically in February 1985 with the gift by Trustee and Mrs. John Runnells of a copy of the first edition, first issue of Charles Darwin's *On the Origin of Species* (London, 1859). The importance of this work in the modern biological sciences is well known, and the Runnells's gift fills an important gap in the collections held in the Mary W. Runnells Rare Book Room. A fine illustrated work, Edward Donovan's *An epitome of the natural history of the insects of China* (London, 1798), came to the Rare Book Collections as the gift of the William Elfenbaum estate. Several other early works on insects were donated to the Rare Book Room by Dr. Ulrich Danckers, among them a copy of the beautifully illustrated *Entomologie, ou Histoire naturelle des Insectes...Coléoptères* (Paris, 1789-1808), by Guillaume Antoine Olivier. Mr. and Mrs. Robert Frank were the donors of a fascinating collection of 86 original photogravure printing plates for a popular series of nature illustrations known as Perry Pictures. Most of the plates were produced in Chicago around 1900 by the A. W. Mumford Co. The end of the biennium brought the gift from the Brooks and Hope B. McCormick Foundation of a collection of 35 original watercolors of baby birds by George Sutton, one of the finest bird illustrators of this century.

The past two years were not without misfortune. It is with regret that we note the loss to the Library and the Museum of Alfreda Rogowski, a veteran staff member who passed away in the spring of 1986.

"Te Maori: Maori Art from New Zealand Collections," featuring 175 artifacts, was on view March 8 through June 8, 1986. 84309

PUBLIC PROGRAMS

Education

The Museum hosted 9,296 school classes during 1985 and 1986, with 446,364 students and their teachers—the highest number of attendant school population since 1977 and 1978. Of these, 6,458 classes of 196,706 teachers and students received special programs to augment their classroom studies and 27,617 participated in special festival days, such as Festival Mexicano, Te Maori, African Heritage Celebration, Dinosaur Day, and the American Indian Festival. In addition, 3,045 teachers borrowed 8,602 items from the department's free loan center, Harris Extension.

Teacher Training was instituted as a regular service, fall 1986, following a successful pilot program. During 1985-86, 163 teachers and student-teachers participated in two-week training sessions, followed by their development and evaluation of a personal model field trip. *Teach the Mind, Touch the Spirit: A Guide to Focused Field Trips* was published by the department as a result of working with teachers in the program and a teacher advisory committee. By year's end, over 3,000 copies had been given free to teachers on request.

School class attendance comprises one-fifth of the Museum's total attendance. Concurrent with school programming, we offer a rich variety of courses, workshops, performances, and participatory activities for our visitors. Over 3,000 adults enrolled in 138 multisession evening or weekend courses, and 4,855 visited 125 ecologically important Chicago area sites during Kroc field trips. Another 327,000 parents and children shared the delight of touching and exploring the structure, size, and texture of shells, meteorites, birds, mammals, and skeletons. They learned about Chinese life by trying on clothes, playing a tangram game, or using utensils—all in the *Place for Wonder.* Another 172,700 experienced Pawnee Indian life in the 1850s reconstruction of an authentic Pawnee earth lodge.

Former one-day festivals became month-long events with specific themes, such as "Animal Antics" and "Come to Your Senses," and 21 different free family features involved 6,750 participants on weekends. Other highlights included "Sweet Saturday Night," performed by Brooklyn Academy of Music Company with dances from black America's back roads, city streets and ballrooms; Anne Pusey's lecture, "Cooperation and Conflict in Lion Societies"; the Continental Drift Symposium; "An Evening of Maori Song, Dance, and Drama"; "Conserving the Wild", Joan Embrey lecture; "Magical Circus from the Orient"; and Donald Johanson's lecture, "Lucy and Our African Ancestors."

The special exhibit "Te Maori: Maori Art from New Zealand Collections" was accompanied by 80 Maori elders, craftspeople, singers, and musicians who came for the opening ritual ceremonies. Twenty of the group stayed for two weeks and presented a variety of daily programs, met with teachers, and consulted with the staff in program development. "Te Maori" also provided the Museum with the opportunity to open the Museum's Maori meeting house, Ruatepupuke II, within the exhibit. A trained group of 36 volunteers gave 2,682 "house" tours to 29,794 visitors between March 15 and June 8, 1986.

Summer and Winter Fun attracted 3,860 children to 215 two-hour workshops. They participated in everything from making masks, musical instruments, and fossil replicas to spending the night in the Museum.

During 1986, the department undertook two new program initiatives: the "World Music " program and the "Hall Interpreters" program. "World Music " presents performances, demonstrations, discussions, and often storytelling by Chicago musicians on weekend afternoons. In various exhibit areas related to a culture's music, visitors experience the rhythmic sounds of an African talking drum and the melodic strains of an American Indian flute, among others. The "Hall Interpreters" program was designed to also place people with objects and materials in exhibit areas to demonstrate various processes and provide interactive opportunities for our visitors Thursdays through Sundays. Both programs will continue and expand in 1987.

In total, 9,584 programs were presented to 795,012 individuals. Much of this would not have been possible without the volunteers who assist us and teach each day. Another 150 volunteers work in scientific collections, public relations, development, and so forth. Together this volunteer support equalled 87,815 hours, or 48¼-man-years of work. In financial terms, this contribution was over $526,890. More importantly, each volunteer contributes a fresh perspective and the public's viewpoint to our work. As part of the Museum family, they are also our best ambassadors to the community at-large.

Outside support was extremely important to our program. It enabled the department to experiment and test new programs for visitors, and to share with and contribute to the museum profession at-large. Grants were received from the following sources: the Joyce Foundation for Student Teacher Internships; Te Maori Interpretive Programs, National Endowment for the Humanities; African Heritage Celebration, City Arts III/IV, Chicago Office of Fine Arts; "Many Faces of Illinois," Adult Course, Illinois Humanities Council; Interpretive Hall Programs—Biology, the Joyce Foundation; Interpretive Hall Programs—Anthropology, the Lloyd A. Fry Foundation; World Music, the Kenneth and Harle Montgomery Fund; Museology for Gifted High School Students, Chicago Public Schools; Technical Assistance for Ethnic and Folk Arts Museums, Illinois Arts Council; and the national program for museum educators, curators and designers, "Museum: Agents for Public Education," the W.K. Kellogg Foundation.

Early photo of Mexican photojournalist Agustin Victor Casasola, whose work was featured in the exhibit "The World of Agustin Victor Casasola, Mexico, 1900-1938," September 12 through November 3, 1985.

PUBLIC PROGRAMS

EXHIBITION

During 1985 and 1986 Field Museum mounted one permanent and two temporary installations of its own collections, played host to four traveling exhibitions and began planning the ambitious renewal of public programs and exhibits that will reach a climax with the Museum's centennial in 1993.

One hundred twenty objects and related photographs of the "Art of Cameroon" from the Smithsonian Institution Traveling Exhibition Service was presented from March 9 through June 16, 1985. Included were prehistoric terra cotta sculptures, objects in different media of ritual and secular use, and a large number of masks, figural sculptures, and other objects.

"The World of Augustin Victor Casasola, Mexico, 1900-1938" exhibited the first major retrospective of photographs of Casasola through 152 prints supplied by the Archivo Casasola. It was on exhibit from September 12 through November 3, 1985.

Although now awaiting reinstallation in a new location, a diorama representing a Botany Department field camp in the coastal desert of Peru was opened on July 23, 1985. Based on the fieldwork there of Associate Curator Michael O. Dillon, the exhibit featured a 4-wheel-drive vehicle such as Dillon uses, and all the trappings and equipment customarily to be found on such a venture. A narrated videotape supplemented the exhibit.

The newest addition to Field Museum's list of renovated halls is the Grainger Hall of Gems, which opened to the public after two years of total updating on November 5, 1985. The new hall is a revolutionary departure from the one it succeeds; only the site remains the same. The gemstones and models, representing a fraction of those in the old hall, were chosen for their rarity, aesthetic qualities, or educational contribution. Great care was invested in developing the successful lighting, air-conditioning and security systems for the dramatic C-shaped case, which houses the 500-object permanent exhibit, or can easily accommodate occasional temporary exhibitions in the future. Also opening on November 5, 1985 was the Grainger Gallery, designed to house a variety of special exhibits in an elegant space next to the gem hall. The first exhibit there was the "Art of Adornment," high-lighting jewelry from many cultures represented in the Museum's anthropology collections. Both these exhibit areas were made possible through the generosity of David and Juli Grainger.

"Te Maori: Maori Art from New Zealand Collections" was on view at Field Museum from March 8 through June 8, 1986, inaugurating the Museum's new climate-controlled special exhibition gallery. The first international exhibition devoted exclusively to Maori art, "Te Maori" owed its existence to the wisdom of the elders and people of the Maori tribes in New Zealand, who have agreed to the journey of their ancestors' treasures *(taonga)* far from their homelands. The carvings represented all periods of Maori art from about 1000 to 1880, and were lent with the cooperation of the thirteen New Zealand museums which housed them.

"Te Maori" traveled to four American cities and was organized by the American Federation of Arts in association with the New Zealand government, the Maori people, and the New Zealand lending museums. The exhibition was made possible by a grant from Mobile. Supported by the National Endowment for the Arts, the National Endowment for the Humanities, an indemnity from the Federal Council on the Arts and Humanities, Air New Zealand, the government of New Zealand, and the National Patrons of the American Federation of Arts.

The exhibit "Gods, Spirits, and People," which went on view on November 22, 1986, presents a sampling of human images from Field Museum's collection of the traditional art of non-Western cultures. "Gods, Spirits, and People" was designed to update the Museum's old Primitive Art exhibit and clear space in the gallery bordering the east side of Stanley Field Hall for a temporary reinstallation of the African collection until a new comprehensive African exhibit can be mounted in the early 90's.

Finally, nearly 50 talented members of the Museum staff had a chance to exhibit their work in "Artists at the Field," that ran from December 13, 1986 to January 11, 1987.

Three hundred years of black American dance were celebrated by Sweet Saturday Night's company of 19 performers on Feb. 2, 1986.

PUBLIC PROGRAMS

Public Relations

In 1985 and 1986, the Public Relations Department's local, midwest, and national media contacts were strengthened and expanded. Particular improvement occurred with family-oriented, feature, and entertainment media. The Public Relations Department hosted press previews for five major exhibits and arranged numerous other smaller media meetings and private tours to generate publicity and build media relations. The department hosted the 1986 Chicago Area Broadcast Public Affairs Association's annual seminar, an event which strengthened relations between the Museum and public affairs directors in the area. In 1985 and 1986 combined, the department generated 3,364 print articles, over 1,000 print calendar listings, 90 radio interview placements, and 89 television placements.

A major highlight was the filming and airing of a special half-hour CBS television special about the Field Museum's scientific research explorations. Bill Kurtis, a Chicago CBS anchorman, and his CBS documentary team followed Field Museum scientists John Fitzpatrick and Michael Dillon into the jungles of Peru and created the show "Islands in the Jungle," which is part I of a new CBS series entitled "The New Explorers." The program aired September 13, 1986 in Chicago, New York, Los Angeles, Philadelphia, Miami, and Seattle.

The program portrayed Field Museum as an institution and public museum that is alive and continually adding to its collections and our understanding of the natural world. Citicorp sponsored the air-time for the show and is further underwriting the development and distribution of a teacher's kit based on the show to 5,000 Illinois teachers.

Other highlights of the biennium included major promotion and publicity for "The Art of Cameroon," "The World of Agustin Victor Casasola," "Gems," and "Te Maori" exhibits. Program, festival, and small-exhibit publicity included the annual Dinosaur Days, Black History Month programs, Festival of Masks, and the "Mountain Light" exhibit. The department made its first major effort with Chicago's Hispanic media in promoting the "Casasola" exhibit. Nearly every Hispanic media outlet in Chicago covered the exhibit and many new media relationships were formed.

Promotion efforts for the "Te Maori" exhibit featured extensive television coverage of the Maori Dawn Ceremony and opening events by Channel 2–WBBM along with 10 other Chicago and Midwest television stations and a tremendous amount of local, national, and international print and radio coverage. WBBM–AM radio did an entire day of live remote broadcasting at Field Museum to celebrate the public opening of "Te Maori." Over 12,000 people attended the opening on March 8, 1986.

In May, 1986, the department generated publicity for the kick-off of the public phase of "Time Future From Time Past," the Museum's $40 million capital campaign. This effort gave good visibility to the event and campaign and also produced follow-up stories.

Our nationally distributed radio series "In the Field" was launched in April, 1986, followed by a fall series in October. The two series, comprised of three- to five-minute programs, with one or two longer special edition programs, covered subjects ranging from "Halley's Comet: All You Ever Wanted to Know, But Were Afraid to Ask," to "Vampire Bats: Fact or Fiction." The interview segments feature Field Museum research scientists speaking on scientific topic of interest to a general audience. The series is designed to be engaging, understandable, and relevant to the listener's life. "In the Field" was distributed to 200+ public radio stations in the continental United States and Hawaii. Our first evaluation survey told us that the two series were well received and were being aired frequently. We hope the radio series will spark an interest in natural history topics and help in building Field Museum's national image and tourist attendance.

To further build tourist attendance, we joined with Adler Planetarium and Shedd Aquarium to launch a summer promotion in 1985 and 1986 that would promote all three institutions as a destination for tourists and day-trip visitors. Entitled "Earth, Sky, and Sea, Visit All Three," the promotion utilized a brochure that outlined mini-visits to the three institutions, local and midwest advertising, and a kick-off media event.

A final highlight was the publicity effort for Roger Tory Peterson who came to Chicago to receive the Field Museum Founder's Council Award of Merit for his tremendous contributions to ornithology. As much an orator as a bird illustrator, Dr. Peterson delighted the reporters with fascinating stories of his life-long passion of birdwatching. Through the interviews and articles the Museum received national attention for the new owl species co-discovered by Museum scientist John Fitzpatrick, who named the bird *Otus petersonii*. This was the first time a bird had been named for Dr. Peterson.

FIELD MUSEUM OF NATURAL HISTORY

Statements of Assets, Liabilities and Fund Balances

December 31, 1986

Assets	Board Unrestricted Fund 1986	Board Unrestricted Fund 1985	Unrestricted Fund 1986	Unrestricted Fund 1985
Cash	$ 2,312,597	$ 1,375,246		
Accounts receivable	379,255	390,791		
Museum stores' inventory	866,700	664,901		
Prepaid expenses	94,943	107,732		
Deferred charges:				
Note issuance costs				
Other	16,912	119,321		
Investments	6,629,362	8,962,112		
Collections	1	1		
Museum property	7,136,866	7,136,866		
	$17,436,636	$18,756,970	$ —	$ —
Liabilities and Fund Balances				
Accounts payable	$ 1,251,860	$ 1,312,652		
Accrued liabilities	494,671	475,432		
Accrued pension contribution	200,898	317,297		
Deferred revenue:				
Contributions		1,500		
Pension gain	155,843	180,996		
Other	38,558	95,470		
Note payable				
Due to (from) other funds	6,334,863	7,450,102	($2,171,872)	($1,749,190)
Total liabilities	8,476,693	9,834,449	(2,171,872)	(1,749,190)
Museum property fund balance	7,136,867	7,136,867		
Fund balance	1,823,076	1,785,654	2,171,872	1,749,190
Total fund balance	8,959,943	8,922,521	2,171,872	1,749,190
	$17,436,636	$18,756,970	$ —	$ —

Restricted fund		Fund functioning as endowment		Endowment fund		Combined total	
1986	1985	1986	1985	1986	1985	1986	1985
$ 1,548,185	$ 764,868					$ 2,312,597	$ 1,375,246
						1,927,440	$ 1,155,659
						866,700	664,901
						94,943	107,732
371,343	370,606					371,343	370,606
						16,912	119,321
22,611,406	18,047,070	$40,002,855	$35,506,349	$13,266,108	$11,423,849	82,509,731	73,939,380
						1	1
						7,136,866	7,136,866
$24,530,934	$19,182,544	$40,002,855	$35,506,349	$13,266,108	$11,423,849	$95,236,533	$84,869,712
						$ 1,251,860	$ 1,312,652
$ 412,450	$ 69,870					907,121	545,302
						200,898	317,297
8,472,798	5,243,044					8,472,798	5,244,544
						155,843	180,996
252,058	36,968					290,616	133,438
17,800,000	17,800,000					17,800,000	17,800,000
(2,406,372)	(3,974,495)	($ 1,756,619)	($ 1,726,417)				
24,530,934	19,175,387	(1,756,619)	(1,726,417)	—	—	29,079,136	25,534,229
						7,136,867	7,136,867
—	7,157	41,759,474	37,232,766	$13,266,108	$11,423,849	59,020,530	52,198,616
—	7,157	41,759,474	37,232,766	13,266,108	11,423,849	66,157,397	59,335,483
$24,530,934	$19,182,544	$40,002,855	$35,506,349	$13,266,108	$11,423,849	$95,236,533	$84,869,712

FIELD MUSEUM OF NATURAL HISTORY

Statements of Revenues, Expenses and Changes in Fund Balances

Years Ended December 31, 1986 and 1985

	Unrestricted Fund		Board Designated Fund	
	1986	1985	1986	1985
Revenues				
Chicago Park District property tax collections	$ 5,248,164	$ 4,238,701		
Government grants	574,385	361,887		
Interest and dividend income	3,299,417	3,322,496		
Net realized gain on investments sold				
Contributions	1,601,139	1,561,646		
Memberships	474,524	477,543		
Admissions	851,797	811,123		
Auxiliary enterprises (museum, stores, vending, tours, food services)	2,575,596	1,744,332		
Other	56,843	37,657		
Total	14,681,865	12,555,385	—	—
Expenses:				
Research and collections	2,667,210	2,628,441	$ 8,406	$ 87,664
Public programs	1,442,657	1,561,140	232,062	18,095
Finance and museum services	5,489,024	4,669,449	21,840	36,556
Development	727,809	724,758	8,404	
Administration	1,480,401	1,073,497	27,745	1,802
Auxiliary enterprises (museum stores, vending, tours, food services)	2,152,799	1,420,414	24,599	
Capital improvement expenditures	217,993	125,424		
Note interest and amortization				
Overhead costs charged to grants	(183,450)	(156,601)		
Total expenses	13,994,443	12,046,522	323,056	144,117
Increase (decrease) in fund balance before transfers and reclassification	687,422	508,863	(323,056)	(144,117)
Add (deduct) transfers:				
Nonmandatory transfer - Board designated fund	(650,000)	(450,000)	650,000	450,000
Transfer - Restricted fund				
Transfer - Board designated fund			95,738	
Transfer - Fund functioning as endowment				
Reclassification of transfer to deferred revenue				
Increase (decrease) in fund balance	37,422	58,863	422,682	305,883
Fund balance at beginning of year	1,785,654	1,726,791	1,749,190	1,443,307
Fund balance at end of year	$ 1,823,076	$ 1,785,654	$2,171,872	$1,749,190

Restricted Fund		Fund Functioning an Endowment		Endowment Fund		1986 Combined	1985 Combined
1986	1985	1986	1985	1986	1985	Total	Total
						$ 5,248,164	$ 4,238,701
$ 842,862	$ 669,361					1,417,247	1,031,248
2,157,510	640,688	$ 231,059	$ 358,161	$ 42,996	$ 65,353	5,730,982	4,386,698
28,131		4,376,596	2,117,698	1,396,216	670,022	5,800,943	2,787,720
2,927,187	1,899,182	1,263,886	1,994,127	403,047	488,931	6,195,259	5,943,886
						474,524	477,543
						851,797	811,123
						2,575,596	1,744,332
2,115,448	856,431					2,172,291	894,088
8,071,138	4,065,662	5,871,541	4,469,986	1,842,259	1,224,306	30,466,803	22,315,339
943,368	818,312					3,618,984	3,534,417
738,482	674,600					2,413,201	2,253,835
25,714	39,651					5,536,578	4,745,656
517,804	299,328					1,254,017	1,024,086
6,810	1,250					1,514,956	1,076,549
522	28,293					2,177,920	1,448,707
4,559,590	1,941,187					4,777,583	2,066,611
851,650	99,283					851,650	99,283
183,450	156,601						
7,827,390	4,058,505	—	—	—	—	22,144,889	16,249,144
243,748	7,157	5,871,541	4,469,986	1,842,259	1,224,306	8,321,914	6,066,195
1,500,000		(1,500,000)					
(95,738)							
(155,167)		155,167					
(1,500,000)						(1,500,000)	
(7,157)	7,157	4,526,708	4,469,986	1,842,259	1,224,306	6,821,914	6,066,195
7,157		37,232,766	32,762,780	11,423,849	10,199,543	52,198,616	46,132,421
$ —	$ 7,157	$41,759,474	$37,232,766	$13,266,108	$11,423,849	$59,020,530	$52,198,616

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Bette Jarz (left) and Trace Clark-Petravick, here processing a newly acquired collection of fossils, were among a large number of volunteers who assisted staff in a wide variety of activities. 84652

FIELD MUSEUM TOURS

Kenya Tanzania Safari

February 20 to March 10, 1988
$5,245 per person
Leader: Audrey Faden

February 20: Your safari begins when you board your British Airways flight to London this evening.

February 21: Arrive London's Heathrow Airport this morning. You will be met and transferred to the Sheraton Skyline Hotel, where day-rooms will be provided until your British Airways flight to Nairobi this evening.

February 22: Upon arrival in Nairobi, you will be met and transferred to the luxurious Norfolk Hotel—a famous colonial landmark and one-time haunt of Teddy Roosevelt, Ernest Hemingway, and Robert Ruark. This afternoon, enjoy a half-day tour of Nairobi, visiting the colorful African market, the unique Kenyatta Conference Center, Nairobi University, and the famed National Museum, known for its superb natural history collection and watercolors by Joy Adamson. Continue your tour by driving through the suburb of Karen, where you will see Isak Dinesen's original home, now a museum. This evening there is a welcome cocktail party and dinner at the Norfolk, with guests of the East African Wildlife Society.

February 23: Today you head toward the famed Tsavo West National Park, Kenya's largest national park. View game through the park before arriving at Kilaguni Lodge for lunch. From the lodge, watch the game come to the nearby waterhole. After lunch, go out in search of the great elephant herds. Your drive takes you to Mzima Springs, where large pools of clear spring water surface at the rate of 50 million gallons a day. Occasionally hippos can be viewed from the tank and cormorants swim by.

February 24: Today you drive to Amboseli National Park, justly famous for its big game and superb views of Kilimanjaro. The 150 square miles of park embody four main wildlife habitats including open plains, acacia woodland, scrub brush, and freshwater swamps. Spend the afternoon viewing animals such as wildebeest, zebra, giraffe, lion, cheetah, elephant, and rhino. Amboseli Serena Lodge.

February 25: Start the day with a dawn game drive in this beautiful park. Early morning is also the best time to view Kilimanjaro before the clouds build up over the summit. Game drive in the late afternoon—the best time to see lion and cheetah as they begin to stir from the shade.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

February 26: Today you drive to Tanzania via the Namanga border, passing through minimal immigration formalities. Continue on to Gibbs Farm, a small, quaint farm in the midst of coffee plantations.

February 27: Today transfer to Ndutu Safari Lodge, situated on the shores of Lake Lgarya near the southeastern corner of Serengeti National Park. Here you will enjoy game-viewing drives both morning and afternoon.

February 28: Today you have game-viewing drives both morning and afternoon to explore the vast Serengeti plains. Here millions of wildebeest and zebra mill across the plains, seeking fresh grasses. You see large prides of lion, perhaps a leopard resting in a tree, groups of hyena, a mother cheetah teaching her cubs to hunt, giraffe, gazelle, topi, and kongoni—the list is endless. Ndutu Safari Lodge.

February 29: This morning you will drive into the Olduvai Gorge, the site of Dr. and Mrs. L. S. B. Leakey's famous discovery of the fossil he called *"Zinjanthropus boisei"* (now classified *Australopithecus boisei*). Here you will enjoy a visit to the small but very informative museum and a short talk by one of Mrs. Leakey's assistants, who will escort you to the site of the *"Zinj"* discovery. Continue on to one of the natural wonders of the world, the Ngorongoro Crater, a caldera created by the prehistoric collapse of a volcano cone. On the crater floor, herds of typical plains mammals live out their destinies: buffalo, zebra, wildebeest, Grant's Gazelle, Thomson's Gazelle, lion, and hyena. Ngorongoro Wildlife Lodge.

March 1: Today we spend down in the crater, tracking and photographing the animals. This great caldera contains some of Africa's finest black-maned lion. Rhino can be seen with calves, and waterbuck appear not to notice the visitors, enabling photographers to shoot at ease. On the lake in the middle of the crater, you can watch thousands of flamingos.

March 2: Descend into the crater once more early this morning for your last game drive here. Later depart to Lake Manyara Hotel, set on the edge of the Great Rift Valley and overlooking Lake Manyara National Park.

March 3: Enjoy a full day exploring the Lake Manyara National Park. This park contains five vegetation zones, thus supporting a large variety of fauna. Notable are the elephant herds and the tree-climbing lions.

March 4: Drive to the Namanga border where your Kenyan drivers will meet you for the drive back to Nairobi.

March 5: This morning you head northwest through undulating Kikuyu farming country, reaching the Aberdare Country Club in time for lunch. Transfer to special club vehicles for your game run to the Ark, which will take you into a deep forested area alive with some of the finest game viewing in Kenya. Driving along the animal trails and paths, you may suddenly come upon elephant, rhino, giant forest hog, Cape buffalo, waterbuck, bushbuck, warthog, colobus monkey, cerval cat, leopard, and perhaps the bongo antelope. The Ark is 'berthed' over a waterhole where the animals come to drink. From an underground dungeon you have an eye-to-eye view of this constantly changing scenario. Darkness descends, but floodlights permit game viewing well into the early morning hours!

March 6: Return to the Aberdare Country Club through the forest and clearings bright with clear morning light. Your safari driver will be at the club to greet you and you head north along

the slopes of Mt. Kenya, then continue on, descending nearly 6,000 feet, passing through the town of Isiolo where your vehicle will suddenly be surrounded by smiling Kenyans holding out wares for you to buy, such as copper bracelets, necklaces, and bangles. Bargain away if you wish, it's expected. View game as you drive through Samburu Game Reserve to the lovely Samburu River Lodge, located on the Uaso Nyiro River.

March 7: Today you have both morning and afternoon game viewing of Samburu's typically 'northern' game—reticulated giraffe, Grevy's zebra, graceful long-necked gerenuk, Somali ostrich and vulturine guinea fowl, none of which you will see further south. Samburu is also a very good park for elephant and the elusive leopard. It is an excellent place for the photographer, with the park's vivid colors and the contrasts between sky, bush, and sand. Bird enthusiasts will be well rewarded with over 300 species, including the martial eagle, in this reserve.

March 8: Board minibus and drive to the famous Mount Kenya Safari Club. Here you have the remainder of the day to luxuriate at this private club made famous by the late William Holden. There is golf, tennis, heated swimming pool, horseback riding, two lovely shops, a beauty salon, sauna, and many attractive rooms set aside for drinking tea or something stronger. The view of Mount Kenya is awesome as are the finely manicured grounds.

March 9: Drive back to Nairobi where rooms will be provided at the Norfolk Hotel until your transfer to the airport for your flight to London.

March 10: Arrive London, where you will connect with your British Airways flight to Chicago arriving later the same day.

This tour will be operated by Abercrombie & Kent.

We still have space on the "Project Canadian Fjords" scheduled for August 16 to 24, aboard the *Society Explorer.* Please call for further information. Field Museum's leader is Dr. Scott M. Lanyon.

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

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1715 N PARK AVE #4
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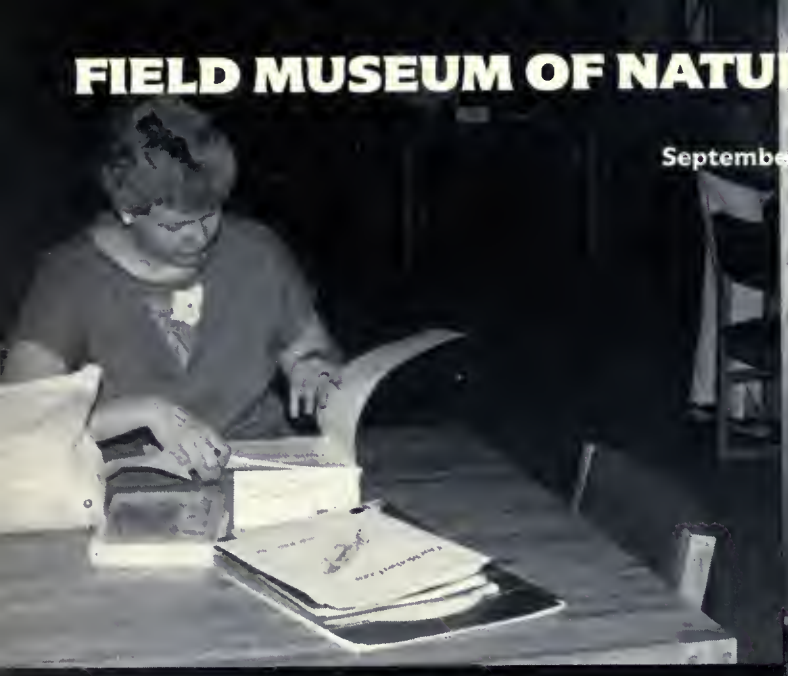
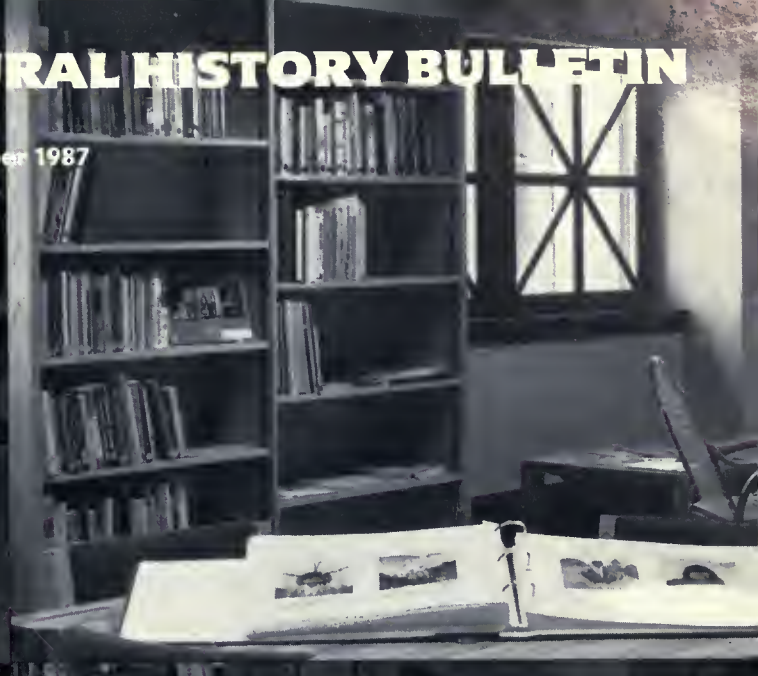
FIELD MUSEUM OF NATURAL HISTORY BULLETIN

September 1987





Webber Resource Center

Dedicated to Native Cultures of the Americas

Grand Opening September 19

Field Museum of Natural History Bulletin

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Costa Rican Forest Preserve Evening Co-Hosted by Field Museum and the Chicago Botanic Garden

On Thursday, September 10, at the Chicago Botanic Garden, Dr. William Burger will speak on "Where Clouds and Mountains Collide: The Magnificent Forests of Costa Rica." Dr. Burger is curator of botany at Field Museum, and the event is a fund-raiser for the San Ramon Forest Preserve in Costa Rica. Dr. Thomas M. Antonio, research taxonomist at the Botanic Garden, will speak on the San Ramon Preserve. The event occurs during World Rain Forest Week, September 7-13.

Dr. Burger's lecture, introduced by Willard L. Boyd, president of Field Museum, will be preceded by refreshments, with cash bar, from 7:00 to 8:00 pm. Dr. Roy Taylor, director of the Botanic Garden, will also speak. The event will take place in the Education Center of the Botanic Garden, in Glencoe, one half mile east of the Edens Expressway on Lake-Cook Road.

Reservations may be made by sending a minimum $20 donation for the San Ramon Forest Preserve to the Tropical Project, Chicago Botanic Garden, P.O. Box 400, Glencoe, Il. 60022. Donations are tax-deductible. Dr. Antonio, at 835-8268, can provide additional information.

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The Webber Resource Center formally opens September 19. Photos by Diane Alexander White (top left GN84830-10, center right GN84829-6), Sophia Anastasiou-Wasik (top right GN84834, center left GN84835, lower left GN84890-21), D. Walsten (lower right). See pp. 8-14.

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EVENTS

Indians of the Americas

Weekends in September

CELEBRATE THE HERITAGE of the Indian peoples of the Americas. Experience their centuries-old traditions which have been passed from mother to daughter and father to son for many generations. Listen to stories, talk with artisans, and listen to the rhythmic strains of Native American music.

Saturday and Sunday
September 12 and 13

Potawatomi Days

In celebration of Chicago's 150th birthday, meet and talk with people of the Potawatomi tribe, the last Indian tribe to make Chicago its homeland.

* *Storytelling* by Leroy Wesaw, from 1:00 to 2:00 pm.
* *Demonstrations:* God's Eyes by Gloria Gilpin, and Fingerweaving by Joy Yoshida, from 1:00 to 3:30 pm.

Saturday, September 19

Webber Resource Center for Native Cultures of the Americas

JOIN IN our grand opening celebration of Field Museum's new Webber Resource Center. Explore the Resource Center's many books, videotapes, maps, photographs, and artifacts that can help you learn more about the Indian peoples of the Americas.

10:00-11:00am: *Hispanic and American Indian Opening Ceremony*
11:00am-12:00noon: *Recognition of Webber Resource Center Development Team*
12:00noon-4:00pm: *Indians of the Americas—Native American Films*
1:00pm-3:00pm: *Demonstrations—silversmithing by Sam Begay and beadwork by Pauline Begay*

Saturday and Sunday
September 26 and 27

American Indian Days

THE CULTURE OF America's Indian peoples has been preserved in their artistic traditions. Watch American Indian artisans as they demonstrate their crafts.

* **Woodland Indian Pottery,** by Frank Ettawageshik
12:00noon-2:00pm
Join Frank Ettawageshik as he creates pottery using the tools and designs of his Ottawa Indian ancestors.

Continued →

E·V·E·N·T·S

Saturday and Sunday, Sept. 26 and 27

American Indian Days

*** Arts of Chicago Indian Peoples**
12:00noon-2:00pm
Chicago is blessed with many talented Indian peoples. Talk with these local craftspeople as they share their heritage with you.

- *Beadwork*—Zena Reeves
- *Basketry*—Annie Linn
- *Appliqué*—Alice Ness
- *Ribbon Work*—Sarah Keahna
- *Dance Shawls*—Alberta O'Shogay
- *Moccasins*—Mary Ellenwood
- *Roaches*—Horace Whitebreast

*** Medicine Wheels**
1:00pm-3:00pm
Find out how the Plains Indians used medicine wheels in this participatory activity.

Hall Interpretive Program

Thursday through Sunday, September

TAKE A HANDS-ON JOURNEY through Field Museum this September. Unearth the links to our past while participating in an archeological dig, learn a string game from the Arctic and create a coil basket. Hall interpreters, located throughout the exhibits, help you experience the wonders of the world. Compare the footprints of *Apatosaurus* to your own; detect fossils in the Museum's floor; and examine birds' nests and eggs. Please consult video monitors for activity locations. This program is partially supported by the Joyce Foundation and the Lloyd A. Fry Foundation.

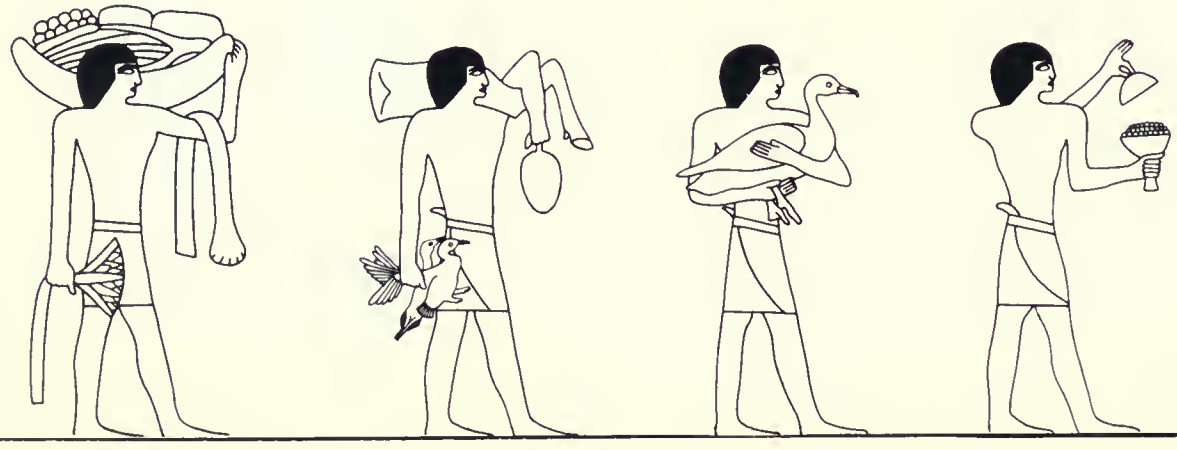
World Music Program

Weekends in September
1:00pm and 3:00pm

JOIN US for live musical demonstrations and informal discussions with the artists.

- ☐ September 5, 6 — 1:00: *Chinese Music Society of North America*
  3:00pm: *Don Pate on bass*
- ☐ September 12, 13 — 1:00pm: *Chinese Music Society of North America*
  3:00pm: *Thai Classical Dance*
- ☐ September 19 — 1:00pm and 3:00pm: *Raices del Ande playing Latin American folk music*
- ☐ September 26, 27 — 1:00 and 3:00pm: *Don Moye, African percussion*

The World Music Program is supported by the Kenneth and Earle Montgomery Foundation, and City Arts III and IV, Chicago Office of Fine Arts.



E·V·E·N·T·S

Adult Programs

Courses

Read the literature of the Ancient Egyptians, learn about Chicago's Potawatomi Indians, or delve into Darwin's fascinating evolutionary theories. Adult courses begin again in September with an exceptional schedule of 6-week, 3-week, 1-day, and weekend programs. Consult the September/October program brochure for details.

Featured Courses

The cultural heritage of Japan is featured in adult programs this September and October. Learn the art of dwarfing a bonsai tree, look backwards in time to Japan's culturally rich Edo period, or perhaps explore the development of the Buddhist tradition. Experience the history and arts of this ancient land in these courses and more, beginning in September.

Edward E. Ayer Lecture Series

September 10 marks the beginning of the Edward E. Ayer Lecture Series. The narrated slide programs, free with Museum admission, begin at 1:30 p.m. and run for eight consecutive Thursdays. September's schedule includes:

☐ September 10
"Tibet Today"
by Elaine Bernstein, Volunteer, Department of Education, Field Museum.
JOURNEY to the majestic Himalayan Mountains for a glimpse of everyday life in Tibet. See how Tibet has been influenced by the modern world while still retaining its ancient heritage and culture.

☐ September 17
"Changing Chicago"
by Irving Cutler, Professor Emeritus, Department of Geography, Chicago State University.
TAKE A TRIP back in time to the early days of Chicago. See why Chicago's physical setting and its great and changing diversity of people create a flurry of economic activity, unique neighborhoods, and interesting future.

☐ September 24
"Life and Death in Bali"
by Vincent Michael, Director of Chicago Programs, Landmarks Preservation Council of Illinois.
EXPLORE THE LUSH LANDSCAPE and fertile culture of the Indonesian island of Bali. Journey from a massive cremation ceremony to ancient volcanoes, from holy healing springs to the black sand beaches of this Hindu paradise.

The series continues through October.

September Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the Weekend Programs sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

September

12 1:30pm *Tibet Today and Bhutan* (slide lecture). See Lhasa and other towns now open to the public, as well as Bhutan, Land of the Thunder Dragon.

19 11:30am *Ancient Egypt* (tour). Explore the traditions of ancient Egypt from everyday life to myths and mummies.

These programs are free with museum admission and tickets are not required.

E·V·E·N·T·S

* After Hours– Films at the Field *

FREE!

Fridays in September, beginning Sept. 11
West Entrance

"The Makioka Sisters" shown on September 11 ◊

After Hours continues its international film series in September, featuring films from Japan. Highlighted October films will be by and about Indians of the Americas.

Doors open at 4:30 p.m. Light fare and beverages from Convito Italiano are available throughout the evening. Films begin at 6:00 p.m. Be sure to use the West Entrance.

For further information call (312) 322-8855.

☐ September 11
"The Makioka Sisters"
1983. 140 minutes. Color. Japan. Director: Kon Ichikawa.
Japanese with English subtitles.

THIS VISUALLY STUNNING FILM chronicles the lives of four aristocratic sisters living in Osaka on the brink of the Second World War. As their genteel and refined world slowly slips away, they must learn to adapt, endure, and weather the changes from without and within.

☐ September 18
"The Family Game"
1984. 107 minutes. Color. Japan. Director: Yoshimitsu Morita.
Japanese with English subtitles.

SHIGEYUKI, the youngest son of a contemporary Japanese family, is not living up to his parents' expectations. They want him to qualify for the best local high school, but he has no interest in academics. *Family Game* is a brilliant deadpan comedy about Japan's affluent middle class and its obsession with success at any cost. Wickedly satirical, the film has a "theatre of the absurd" liveliness, mixing exquisite visuals, harsh realism, crazed surrealism, and outright slapstick.

☐ September 25
"Muddy River"
1981. 105 minutes. Black and white. Japan. Director: Kohei Oguri.
Japanese with English subtitles.

OGURI DETAILS the experiences of a young boy growing up in an Osaka backwater in 1956, capturing the stillness and tension of a suspended moment. It is a tale of a child caught between the worlds of children and adults, and of a Japan suspended between postwar disillusionment and economic boom.

☐ October 2
"The Go Masters"
1982. 123 minutes. Color. Japan/People's Republic of China. Directors: Junya Sato and Duan Ji-Shun.
Japanese with English subtitles.

THE GO MASTERS is the first film to be co-produced by Japan and the People's Republic of China. Go is a 3,500-year-old Chinese board game popular in both China and Japan. In 1924, a Chinese boy is sent to Japan to study go with a Japanese master. Because of political confrontations, he is forced to stay in Japan against his will and loses contact with his family. The rest of the film follows the characters in their search for each other. Photographed against the magnificent landscapes of old Japan and old China, *The Go Masters* is a beautifully portrayed mix of two ancient cultures.

E·V·E·N·T·S

The Webber Resource Center

Sophia Anastasiou-Wasik 084835

A spacious new facility, dedicated to native cultures of the Americas, now offers visitors a variety of fresh experiences: the use of audio and videotapes, a library, the chance to examine artifacts more closely, and the opportunity to see researchers as well as craftsmen at their work

by Nancy Evans
Developer, Webber Resource Center

Diane Alexander White GN84829-6

The Webber Resource library features a wide variety of books and periodicals for children, adults, teachers, and the casual browser.

Have you ever wondered why there are people on top of the Field Museum's Pawnee earth lodge? Or how the Pomo Indians of California make such exquisite baskets? Have you ever had a question about an American Indian exhibit but did not know who to ask or how to find the answer? The Field Museum now has a unique facility where you can bring all your questions about Indians of the Americas; staff persons there will help you discover the answers. The Webber Resource Center for Native Cultures of the Americas is stocked with books, audio and videotapes, Indian artifacts, photographs, and maps which can assist teachers planning Indian study units, students researching papers, and Museum visitors inspired to know more about America's native peoples.

The spacious new facility which will eventually occupy the area of an entire exhibit hall, opened in June, and is the first of many changes—large and small—to occur as we get ready for the Field Museum's centennial celebration in 1993. In approaching its second century, the Museum conducted an exhaustive self-study—"Centennial Directions"—in 1984-85 to assess the effectiveness of its public and research programs (see October 1986 *Bulletin*). Centennial Directions made it clear that fresh new ways of exhibiting materials and informing visitors about natural history are needed.

Accordingly, a new program consisting of three exhibit formats was set up:

"*Informal, interactive exhibits and programs,* which will be directly accessible to virtually any visitor.

Major thematic exhibits, which will provide broad overviews of their subjects and highlight the Museum's collections.

Study halls, which will make available in-depth resources on specific subjects, for the visitor seeking a more comprehensive picture of the subject matter and collections."

Upon E. Leland Webber's retirement as Museum president in 1981, the Board of Trustees established a fund to develop an exhibit honoring Mr. Webber and recognizing his 31 years of service. In 1986 it was decided that a fitting tribute to Mr. Webber would be the creation of the Museum's first study hall out of these monies.

Walsten

The lounge area invites Museum visitors to sit, relax, read, or study in comfort.

The concept of the study hall, though new to Field Museum, is nothing new in the world of museums. The Boston Children's Museum Resource Center features a library and a collection of hands-on objects to aid visitors in learning more about American Indians, Asian peoples, and other subject areas featured in the museum's exhibits. In the Children's Museum's American Indian and Japanese exhibits are glassed-in storerooms for artifacts, giving visitors a chance to see a part of the museum's behind-the-scenes areas.

The Naturalist Center of the National Museum of Natural History of the Smithsonian, in Washington, D.C., is an artifact-rich resource center. Study collections of anthropological artifacts and natural history specimens help visiting collectors to identify the fossils, shells, insects, or projectile points in their personal collections. Reference books can also be found near these study collections to help visitors learn more about their own specimens.

The National Zoo, also in Washington, has established resource centers, such as the HerpLab, at various sites in the park. The HerpLab provides the opportunity to explore the world of amphibians and reptiles beyond just observing them from the other side of a glass wall. Visitors can participate in a research project concerning color-changing in chameleons or they can simply examine live turtles and snakes up close.

The Webber Resource Center has many features in common with these other centers—but it offers much more. It is unique in that its study collections and hands-on objects are combined not just with books (the situation at other resource centers), but with audio and videotapes, archival photo albums, and a collection of maps.

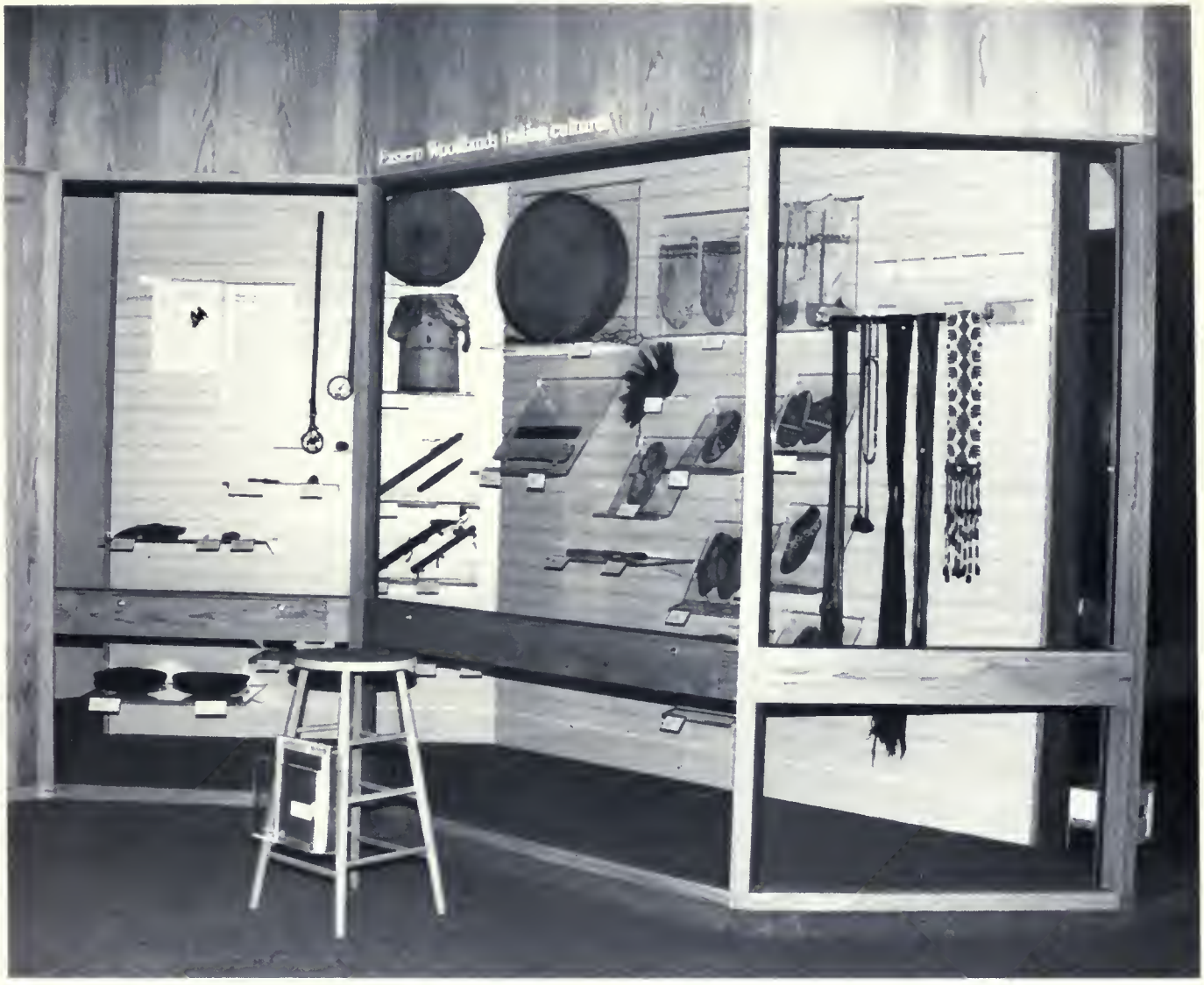
The Webber Resource Center's library has a full range of books on the native peoples of the Western Hemisphere. Current periodicals, including tribal newspapers, give coverage to issues concerning Native Americans today. Curriculum aids are available for teachers in planning study units on American Indians, a shelf of books just for kids is there, as well as a collection of maps, conveniently arranged and easy to consult.

Diane Alexander White GN84829-10A

Walsten

Above: In soundproof audio-video booths, visitors can listen to music of Indians of the Amazon or watch a videotape about life on a reservation. Below: Newspapers and magazines published by Native Americans offer visitors insights into issues facing Indian peoples today.

Sophia Anastasiou-Wasik GN84830-22



Walsten

Left and above: Artifacts made by Eastern Woodlands Indians have been moved from storage into public view. Left below: The anthropology lab gives the visitor a glimpse of behind-the-scenes scientific research and conservation work.

Among the Center's special features is its collection of nearly 100 audio and videotapes, which can be heard or viewed in comfortable booths. Several of the videotapes were produced by American Indians themselves, giving them the opportunity to tell their own stories. Families can enjoy a videotape produced especially for kids. They can see and hear the experience of growing up on a reservation in the Southwest or get an idea of what life is like for the Arctic Eskimo. Persons wishing to watch a videotape or listen to a tape of Indian music may select one at the Center's information desk.

And there are other materials available at the desk: Activity boxes, containing artifacts that can be held and closely examined; photo albums from the archives of the Department of Anthropology, offering views of the past and showing how Native Americans lived in the nineteenth century or as recently as a generation ago.

Display cases in the Center contain a great many artifacts that have been out of sight in anthropology storerooms for decades. (Less than half of the Museum's American Indian artifacts are currently on view in the exhibit halls.) But this area of the Resource Center now provides visitors with views of collections that the Museum has, for reasons of space, not been able to display. And there are drawers loaded with archaeological artifacts which can be helpful to visitors who wish to identify an arrowhead—or whatever—that has lain for years in their attic. Identification guides in the Resource Center library provide further help to such visitors.

The "Ottawa Machine" is a breakthrough in conservation technology. It maintains a constant humidity in the Resource Center's collections cases to prolong the life of the artifacts. D Walsten

The anthropology lab is another of the Center's special features. For many years, Museum members have been given the special opportunity, on Members' Night, to roam through the building's scientific research areas, observing science in action and getting a glimpse of newly acquired collections. The Resource Center's anthropology lab can now provide that same opportunity for many other visitors who may be unaware that research goes on behind the scenes at Field Museum. Periodically, Department of Anthropology staff will work in the lab, cleaning and repairing artifacts; visiting scholars will conduct their research on collection materials in the presence of interested visitors.

The Museum hopes that visitors will find the new Center useful and exciting, but since the facility is an adventure into new territory, it is uncertain how it will work, how people will use it, or, in fact, if the resources and facility will satisfy a genuine need.

Accordingly, the Center is being constructed in two phases. With phase I, completed in June, about 60 percent of the planned Center was ready for use.

A period of evaluation, phase I, will last for at least several months—until we have a clear picture of how the Center is being used, what areas are most popular with visitors, which should be expanded. If the audio and videotapes prove to be popular, more will be added in phase II; if visitors want to see more artifacts, additional collection cases will be installed in phase II.

At the end of June, the Resource Center quietly opened to the public. There was no public opening ceremony. The summer months have now provided ample time to observe how visitors use the Center and to make some adjustments for smoother operation. Now we are ready to celebrate the addition of this exciting, new facility in grand fashion. All Field Museum members are invited to attend the Grand Opening Celebration to be held on Saturday, September 26, from 10:00 a.m. to 3:00 p.m. Watch Indian artisans demonstrate their skills and sample some of the fine tapes in the Webber Resource Center's video library. (For complete schedule see p. 3.)

If you are unable to join in the September celebration, plan to stop by the Webber Resource Center on your next Museum visit. Come in and read a book, examine an artifact, look through some of the photo albums, listen to Indian music, ask questions, browse, sit and relax. The Webber Resource Center staff will be glad to help you learn more about the extraordinary native peoples of the Americans. **FM**

Woodland Birds of Illinois

Questions and (Some) Answers About Why Their Numbers Change

by Scott K. Robinson

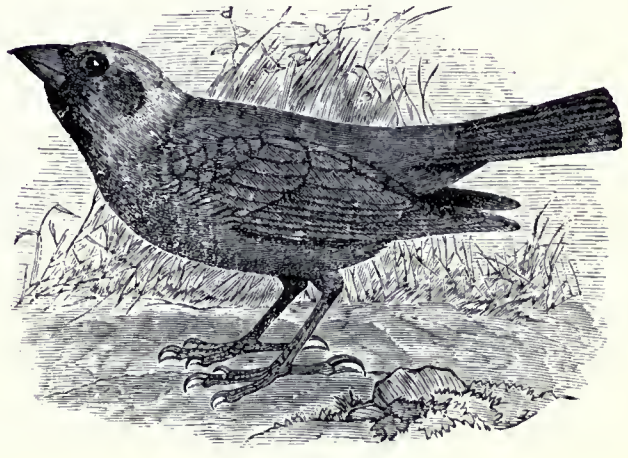
Even though Illinois is commonly regarded as a prairie state, as much as 40 percent of its lands were covered with forests when the pioneers arrived. Most forested areas were in the southern portion of the state, but there were also extensive forests along the major rivers and in northwestern Illinois.

As these forests were cleared for timber and agriculture, the bird community underwent drastic changes. Several formerly abundant species such as the passenger pigeon and Carolina parakeet became extinct, while others such as the pileated woodpecker retreated to a few strongholds in areas that were too wet or hilly to cut. Now, the remaining wooded areas are small and scattered, and only about ten percent of the state is forested. The largest unbroken forest tracts are in the Shawnee Hills of the southern tip of Illinois and these comprise areas of only a few thousand acres. What is the effect of this habitat reduction and fragmentation on the remaining wildlife? Which species thrive and which species suffer in a fragmented landscape? Are small woodlots net producers or importers of young birds? These and other questions have been the subject of intensive investigations here in Illinois and elsewhere in the country.

Evidence is accumulating that forest fragmentation has a negative impact on many forest birds. Small woodlots have a number of features in common that make life difficult for many birds. First, small woodlots are often islands in a sea of corn, soybeans, and residential areas. Any bird populations that become locally extinct must be recolonized from other wooded areas, which are often far away. Because populations in fragmented woodlots are also small, such local extinctions can occur regularly.

Second, wooded islands, to a much greater extent than oceanic islands, are profoundly affected by their surroundings. In agricultural areas, the waste corn left in the field provides abundant food for many potential nest predators such as raccoons, opossums, and squirrels, all of which thrive in small woodlots. Data gathered in Maryland, Connecticut, and Maine suggest that nest predation is much higher in small woodlands than in large forests. Neighborhood cats and blue jays take severe toll of eggs, nestlings, and fledglings. Blue jays have become an especially severe problem over the last few decades because their populations have increased

The brown-headed cowbird, a brood parasite known to lay eggs in the nests of more than 200 other species, has increased greatly in numbers in recent times, due to the clearing of land and the spread of cattle farming.



Scott K. Robinson, who earned his Ph.D. at Princeton University, is an ornithologist with the Illinois Natural History Survey

The birds shown on pages 16 through 21 are mounted specimens in the Field Museum collection.

nationwide as a result of the increased popularity of bird feeders.

Third, small woodlots have proportionately more edge habitat than larger woodlands. Edge habitat is favorable for many species of birds and for wildlife in general. Many familiar birds such as cardinals, rufous-sided towhees, indigo buntings and brown thrashers are much commoner along forest edges than in the forest interior. All of these species are probably much commoner now than they were before the pioneers arrived. Yet, edge habitat also creates severe problems for many species that nest in the forest interior. The reduced populations of forest interior birds in small woodlots may be partially due to competition with "edge" species, though this thesis may be difficult to prove. Nest predation has also been shown to be higher along habitat edges than in the forest interior, mostly because many potential nest predators favor habitat edges.

Fourth, and for many species the most severe problem of nesting in small woodlots, is the brown-headed cowbird, a brood parasite that lays its eggs in the nests of other species (the host). Cowbirds parasitize more than 200 species of birds, including most Illinois woodland songbirds. A few species such as northern (Baltimore) orioles, robins, and brown thrashers have evolved defenses against cowbirds—they simply throw out any "foreign" eggs placed in their nests, or abandon a parasitized nest and start over. Most species, however, accept cowbird eggs and raise the young as if they were their own. Because cowbird chicks hatch early, grow faster, and are usually larger than host chicks, a parasitized nest often produces no, or very few, host young. Therefore, cowbird parasitism can have a disastrous effect on many host species if parasitism rates are very high.

The blue jay has become a problem in some areas as the result of the increased popularity of bird feeders.
81697

Cowbird populations have increased dramatically in recent times due to the clearing of land and the spread of cattle farming. Cowbirds search for nests to parasitize in all habitats but usually feed on bare soil or in short grass where there are cattle or other livestock. Cowbirds may fly as far as five miles to a cattle feedlot to forage in the afternoon after a morning of nest searching. Small woodlots in agricultural areas are therefore ex-

tremely vulnerable. The area surrounding woodlots can support many cowbirds, all of which must find places to search for nests. In some woodlots, cowbirds are the commonest species, and because each female lays 20 to 40 eggs a season, cowbirds can potentially parasitize every nest in an area. Larger woodlands, on the other hand, are less vulnerable because cowbirds have to travel further to and from foraging areas. Studies in Wisconsin and Maryland have shown that parasitism rates are much higher along the edges of large forests than in the interior. Large forests such as those in the White Mountains of New Hampshire and the Great Smoky Mountains of Tennessee have virtually no cowbird parasitism.

Taken together, these observations suggest that large forested areas are much safer places for many songbirds to nest. In many areas, however, only small forest patches remain. What has happened to songbirds in these areas? Data from the East show that many forest interior species such as warblers and vireos have declined precipitously within small woodlots. Similarly, small forested islands often lack many species for which there is apparently suitable habitat. These observations have led some to suggest that forest fragmentation is causing a nationwide decline in songbirds, especially those that migrate to North America from the neotropics. These long-distance migrants arrive late and have only one or two opportunities to nest in a given season. The loss of a nest to predators or any effort wasted on raising cowbirds therefore has a much greater effect on migrants than on

The ovenbird maintains healthy populations in some areas, despite cowbird predation. The reasons for this are unclear. 81934

The brown thrasher—like the robin and Baltimore oriole—defends itself against cowbird predation by removing cowbird eggs from its nest or by starting a new nest elsewhere. 81902

Geology Hall Changes

The Field Museum is planning a major new exhibit, "The Pacific." This exhibit will be interdisciplinary, covering all aspects of the Pacific Ocean Basin—the geological formation of its island groups, the biology of these islands and the seas surrounding them, and the many and diverse peoples of the islands, their cultures, and their art.

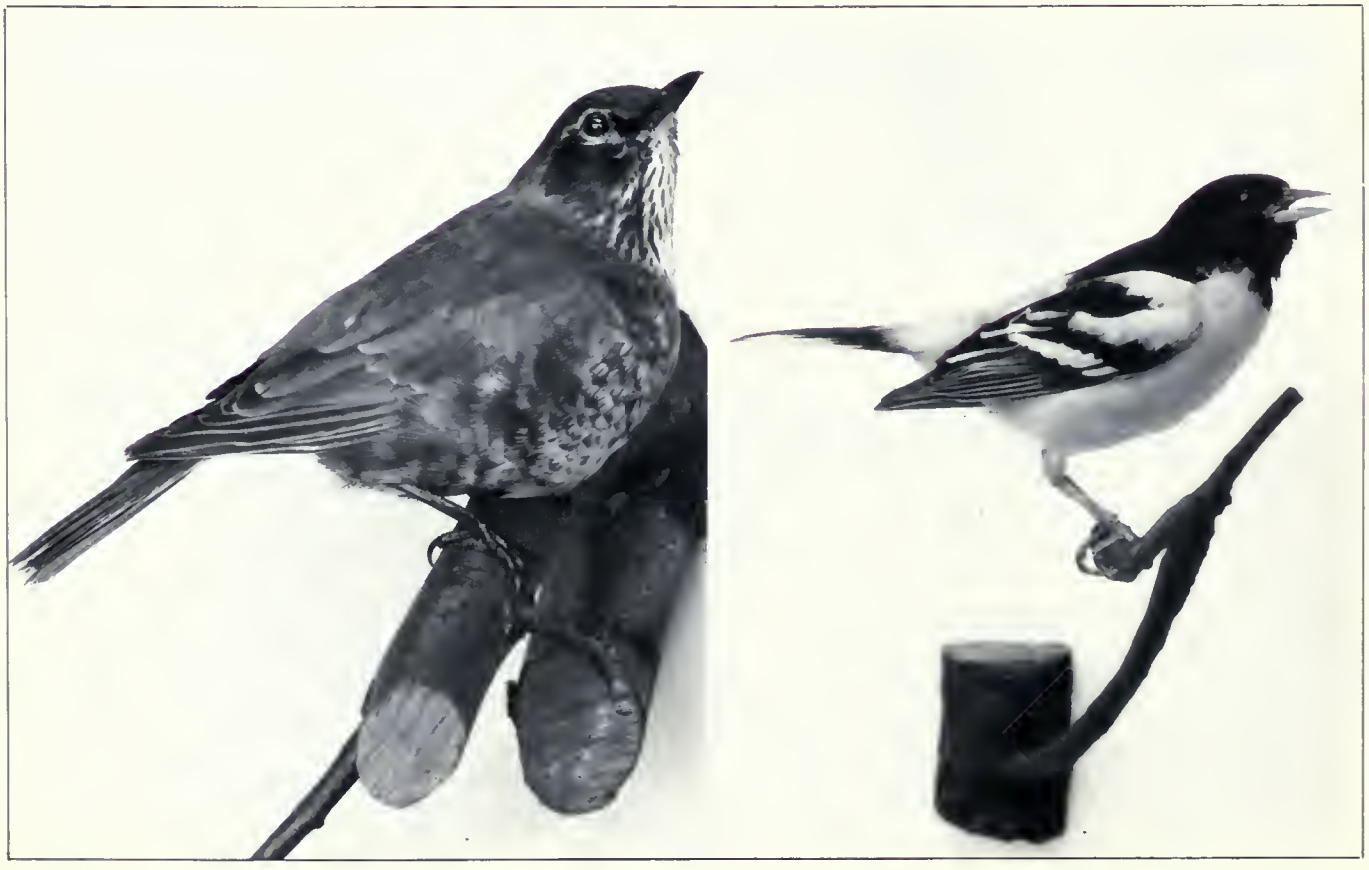
This exhibit will occupy over 17,000 square feet of space, created by joining the existing Halls 35 and 36. Hall 35 now houses a systematic display of minerals and meteorites. Hall 36 exhibits economic ore minerals and the products made from them. These exhibits will be eliminated in order to make room for the Pacific exhibit.

At present, an adjacent hall, Hall 34, displays general geological features and processes. The contents of this hall will be removed temporarily and the hall painted and carpeted. Hall 34 is scheduled to be reinstalled early in 1988. In that reinstallation, portions of the exhibit elements formerly shown in Halls 35 and 36 will be incorporated. This single geology hall will then show aspects of the original three physical geological halls (34, 35,36).

year-round residents, which nest many times a season. Most neotropical migrants also build simple "open cup" nests, which are especially vulnerable to cowbird parasitism. Cowbirds do not parasitize hole-nesting birds such as the black-capped chickadee, tufted titmouse, and white-breasted nuthatch, all of which thrive in small woodlots.

With these problems in mind, a team of researchers from the Illinois Natural History Survey has begun a long term study of the bird communities in a complex archipelago of small woodlots and thickets bordering Lake Shelbyville in central Illinois. These woodlots, which are dominated by white, red, and black oaks, are mostly small (20-150 acres) and abound in edge habitat. The largest woodlot (150 acres) is surrounded by over 10 miles of edge, including 7 miles of lake edge and 3 miles of edge along agriculture fields. No part of any wooded area is more than 250 yards from an edge.

It is clear that these woodlands have all of the problems associated with fragmented habitats described above. Blue jays abound everywhere, with early summer populations approaching 80 individuals per 100 acres; most of these bluejays search for bird nests as well as insects. Raccoons, opossums, squirrels, and skunks are



Robin 80576

Baltimore Oriole 71204

frequently observed both in the forest and in the agricultural fields where they often feed. Forest edge species also nest abundantly along forest boundaries and regularly foray into the forest interior in search of food. Perhaps most ominously, brown-headed cowbirds are generally the commonest species recorded in the forest on census and in mist nets, which are used to capture birds for study. In 1986, for example, cowbirds were recorded on over 90 percent of the census stops in all habitats. No other bird is as ubiquitous or abundant.

The black-capped chickadee, a hole-nesting species, is safe from the predations of the cowbird and is thus able to thrive in small woodlots. 77541

The data on nesting success of woodland birds from the Shelbyville area show the difficulty of raising young in the face of such adversity. The overall predation rate on 145 nests located in 1985 and 1986 was over 80 percent, a figure nearly twice as high as the usual predation rate on songbird nests. In addition, over 73 percent of all nests of species that accept cowbird eggs were parasitized, one of the highest parasitism rates ever recorded. What is more, most parasitized nests were multiply parasitized — they averaged 2.6 cowbird eggs and only 2.3 host eggs per clutch. Clearly, in the face of such overwhelming predation and parasitism the chances for nest success are very slim. Censuses conducted late in the breeding season turn up very few young of species that are vulnerable to parasitism.

The wood thrush, a bird best known for its beautiful song, provides us with an especially grim demographic picture. Wood thrushes nest in most woodlands, but accept cowbird eggs and have only one or two opportunities to breed before they return to their winter grounds in the tropical forests of Central America. In 1985 we made a concerted effort to find wood thrush nests in two small woodlots. Of the 15 wood thrush nests located, each contained at least one cowbird egg. One had 11 cowbird eggs, the world record for this species; the female dutifully incubated this huge clutch but hatched only a single cowbird. Overall, these nests averaged 3.8 cowbird and

only 1.1 thrush eggs per nest, and fledged 11 cowbird, but only 2 wood thrush young. It seems very unlikely that this wood thrush population could be producing enough young to replace itself.

Given these formidable problems and the highly fragmented nature of the habitat at Lake Shelbyville, it is remarkable that any migrant song birds nest there. Yet, extensive censuses of the area reveal relatively high populations of many species known to be "area-sensitive," *i.e.*, to occur only in larger woodlots elsewhere in the country. For example, wood thrushes nest commonly in spite of their very low reproductive output, and there are several small populations of ovenbirds, a warbler usually considered as a good indicator of forest interior habitat. In fact, throughout the Shelbyville area, most species nest in any area where there is suitable habitat, though populations fluctuate locally.

Herein lies a mystery of sorts: how can these populations persist when they produce so few young and from where do new birds come if they are not locally produced? One possibility is that the birds that nest in the Shelbyville woodlots are produced in larger, less fragmented forests elsewhere. If this is true, then these birds must be dispersing very great distances indeed because there are no large, unbroken forests within a 100-mile radius of Lake Shelbyville. Nevertheless, it is possible that small woodlots such as those around Shelbyville represent dispersal "sinks" or "traps" where dispersing young settle, but fail to produce enough young to replace themselves. Another possibility is that the nests we find are those that cowbirds also find because they are poorly hidden. Better hidden nests may have a much higher success rate than our data indicate. In fact, Illinois woodland birds hide their nests extremely well—even experienced observers can spend an entire day searching for nests with no success. Although frustrating for researchers, the cryptic behavior of most forest birds may be the only way they can avoid attracting the attention of predators and nest parasites (cowbirds). Therefore, the observed parasitism and predation rates may be higher than the actual rates.

Much of the current research conducted in Illinois and elsewhere in the country seeks to determine under what conditions a woodlot becomes a net producer and exporter of young and under what conditions a woodlot becomes a population "sink" where dispersing young are lured to breed with little chance of success. Once these questions are answered, we can begin to design nature preserves and forest management practices that create as many productive areas as possible.

There are several more points that should be made before closing this discussion of the effects of forest fragmentation on birds. First, the importance of woodlots for migrant birds cannot be overemphasized. As any birdwatcher can tell you, the smaller and more isolated a woodlot is, the higher the concentration of migrants in it. Tiny woodlots in central Illinois and along the Chicago lakefront are famous migrant "traps" where birdwatchers and birds occur at fantastic population densities during migration. Even if small woodlots prove to be population "sinks," the beneficial effect on the thousands of birds that use them during migration should far outweigh the costs to the few birds that breed in them.

Second, the rate of destruction of different kinds of forest habitats has not been equal. Bottomland and

The white-breasted nuthatch, like the black-capped chickadee, is safe from cowbirds because of its hole-nesting habit.

81950

The prothonotary warbler, a formerly common bottomland species, is now rare and local throughout Illinois. 81940

floodplain forests, by far the richest wooded habitat for birds in Illinois, have been more severely affected than drier upland oak/hickory forests. Only a few extensive bottomland tracts remain, chiefly in southern Illinois, and they are in constant danger of being cut for timber or to clear land for soybeans. Many formerly common bottomland species such as cerulean and prothonotary warblers are now rare and local throughout the state and others such as the Swainson's warbler have statewide populations of only a few pairs.

Third, there is increasing evidence that at least a few songbird species have remarkably specific habitat requirements. The obscure worm-eating warbler, for example, is restricted almost entirely to steep north or east-facing slopes along ravines in Illinois. Yellow-throated warblers depend chiefly on sycamores and conifers, and Swainson's warblers require canebreaks, which are comprised of a northern member of the bamboo family. Many other species such as Acadian flycatchers and Louisiana waterthrushes require streams or standing water, whereas ovenbirds favor dry, relatively flat, wooded ridgetops. Regardless of size, forest tracts that lack these habitat features will also lack these specialized species. In general, however, the larger a wooded area, the more likely it is to contain several different kinds of forest. Clearly, it is important to consider both forest size and composition when planning strategies to preserve forest birds.

Finally, not all of the problems faced by migrants occur on the breeding grounds. Species that winter in tropical forests have a potentially more serious problem —habitat destruction in Central and South America. Most of "our" birds winter in a surprisingly small section of the neotropics, from southern Mexico to northern South America and in the Caribbean. In winter, migrants pack into areas much smaller than their breeding ranges, often less than a fifth the area. Therefore, clearing a square mile of tropical forest is equivalent to clearing five or more square miles of forest in North America. If tropical deforestation continues at its current rate, the time will come when some species such as the wood thrush will decline regardless of what happens on their breeding grounds. This does not mean that we will be excused from worrying about what happens in Illinois. It does, however, demonstrate the importance of considering the year-round needs of migrant birds in a increasingly fragmented environment. **FM**

Inside the earth lodge, Coordinator Mary Ann Bloom explains materials to schoolchildren.

Pawnee earth lodge built at the St. Louis Exposition of 1904. Photo by former Field Museum photographer Charles Carpenter.

Pawnee Earth Lodge Marks 10th Anniversary

by Mary Ann Bloom
Coordinator, Pawnee Earth Lodge

In 1987 nearly 100,000 visitors will walk into the traditional lifestyle of the Pawnee Indians as they tour Field Museum's full size replica of a Pawnee Earth Lodge.

While sitting on buffalo robes inside the earth lodge, visitors learn about Pawnee life as it was in the 1850 s. Volunteers tell the story of an exciting buffalo hunt or describe the rituals of the medicine men. Spoons formed from buffalo horns, a child's sled made of buffalo ribs, and a feather-covered war shirt are just a sampling of the touchable artifacts which fill this hands-on exhibit.

October 1987 marks the 10th anniversary of the Pawnee Earth Lodge. Members of the Pawnee tribe will come to Field Museum to perform a private lodge rededication ceremony. The Pawnee worked closely with Museum staff in the planning and design of the lodge. We look forward to the return to Chicago of our Pawnee friends and invite everyone to join us for our special 10th anniversary activities.

* **Thursday, Oct. 22 and Friday, Oct. 23**
10:00 a.m. to 1:00 p.m. Pawnee craft demonstrations.
10:30 a.m. Pawnee dance performance.
* **Saturday, Oct. 24 and Sunday, Oct. 25**
12:00 noon to 3:00 p.m. Pawnee craft demonstrations.
2:00 p.m. Pawnee dance performance.

Tickets are not required, activities are free to the general public with Museum admission. School groups attending should make advance registration in writing.

Throughout the year volunteers present programs daily in the lodge. Call (312) 322-8852 for information regarding current program schedules.

Dolores Arbanas, Eleanor DeKoven, Anne Ekman, Michael Hall, Shirley Hattis, Gabby Margo, Mary and John Nelson, Mary Anne Peruchini, Judith Sherry and Karen Urnezis will also celebrate their 10th anniversary as Pawnee Earth Lodge volunteers.

Above: Pawnee Tribe members in 1976 gather with Field Museum's former coordinator of the Native American Program, John White (rt.), to discuss model of the earth lodge (foreground), built by Kevin Williams (left). *Below:* Early in 1977 the lodge framework was completed.

Walsten

Ron Testa

Above: Life-size mannequins atop the lodge. *Below:* Lodge interior, showing ceremonial objects.

Ron Testa 106164

Above: Volunteer Forman Onderdonk (left) explains furnishings to visitors. *Below:* Lodge interior. The lodge is 38 feet in diameter and 18 feet high at the center. Groups of 35 can be accommodated for formal programs. Some of the furnishings were made especially for the Museum lodge by Pawnee Tribe members who also participated in taping seasonal activities and ceremonies for use in Museum programs.

Ron Testa 106165

THE GEOPOLITICS OF AMERICA'S CORN BELT

where the past ice age glacier sat affects mid-america's food production—even its politics

by Edward Olsen
Curator of Mineralogy

As you fly over the cornbelt of America's Midwest you might think it all looks pretty much the same from a plane window. On the ground, if you pay attention to details, you can see the difference.

Going south from Chicago through Illinois you can easily be convinced the earth is flat—that a cup of water poured on the ground would sort of meander around, not knowing which way to flow it's so flat. In the summer the corn is lush and green, the stalks are tall and stand close together, and the soil is rich and dark. Things look pretty good.

About two-thirds of the way down the state the picture changes. The corn is not quite so tall and lush looking, and the soil is lighter colored. The land is generally more hilly, and tilling it is more difficult for farmers. Generally, things don't look quite as good as they did farther north.

The same change can be seen as you travel through Indiana from Gary to Evansville. What you see is the result of the past ice age that made the present middle western landscape—and its economy, and even some of its politics.

Our lives are short compared to geological activities, so we tend to think that what is going on now is the way it always was. Every once in a while a geological event takes place on a short time scale and we get some idea of what big changes can take place. An earthquake lets go or a volcano blasts its top off and crisis is with us. Ice ages don't have such speedy time scales, but when they get going, they are a force of tremendous power.

Over a million and a half years ago the climate of the Northern Hemisphere began a serious change. Summers in places like northern Canada became colder and the onset of rotten winter weather started sooner. Within the first few hundred years permanent snow fields grew that didn't go away during the cool summers. As snow piled on snow, the layers at the bottom were squeezed tighter and tighter, and large ice crystals formed. When all this was stacked high enough the pressure at the bottom got so great that ice crystals slowly deformed and squeezed past other ice crystals and the whole mass began to ooze southward. As it moved it picked up soil and gravel and rocks—billions of tons of them. The ice grew to be over two miles thick and covered most of the midwestern states.

Then things changed—the climate began to warm up slightly. The ice continued to move forward, but at the edge of the ice sheet melting went on at a great rate. The ice wasted away faster than it pushed southward, with the effect that the ice edge slowly moved back north. Four times in the last million years the ice advanced and then retreated. Each time it advanced southward it eventually halted and the edge melted back. The last retreat began around 15,000 years ago. The meltback uncovered most of northern Canada except parts of

the Canadian Artic and Greenland, which are still ice covered year 'round.

Each time the ice melted back it let down the billions of tons of soil and rock that it had scraped up farther north. Low places in the landscape were filled in, so the land surface became flatter than flat. If the ice hadn't overridden Illinois, towns like Chicago would have the topography of the buried bedrock, with ravines and bluffs and cozy glens. It would be a lot prettier, but the economy would be very different.

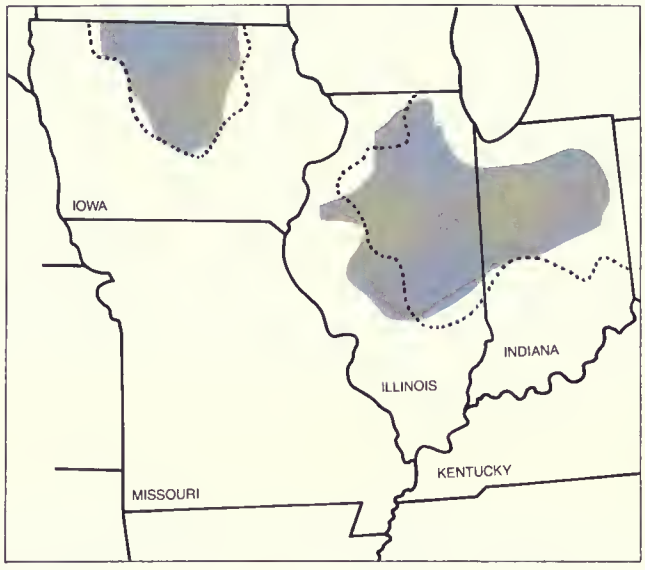
At each retreat the melting ice let down tons of rich soil. Each of the four advances of the ice sheet went through this cycle of wasting away, letting down rich soils and rock carried in it, filling in and smoothing the topography under it. The good soils left behind by each ice advance were overrun and partly ruined by each following advance. The last advance, however, left behind its load of good stuff and no fifth advance has arrived yet to override it. That's the key to the present landscape.

A geologist, roving around the Middle West, can plot on a map the rich glacial deposits and from this can see the outline of the last ice sheet. It turns out he could get a similar result by plotting differences in the crop and economic conditions in the Middle West. If the areas under the old glacial cover have the better soils on land that is generally flatter and easier to farm it should show up in better crop yields. Map A shows a plot of the highest density of grain elevators with capacities of 400,000 tons of grain or more for the states of Illinois, Indiana, and Iowa. This leaves out all of the elevators with small capacities. The dotted line indicates the edge of the last ice sheet in these states, as mapped by geologists. It's a pretty good fit.

That's why the corn is so thick and healthy, and the farms look pretty well off inside the line of the glacial advance, and why life looks somewhat leaner outside of that line. Other facts show up, too.

In the glacially covered areas land values and total farm values are higher than in adjacent areas outside the old glacial cover. On the other side of the coin, in the areas *not* covered by the last glacier more land is unimproved, and over twice as much land is left as woodlands. Unimproved woodlands have environmental advantages, but they don't yield income for the farmers who own them. When the Middle West was first settled no one had any idea a glacier had been there. It was just luck for some families that settled on the high-yield lands.

There is another curious situation: Most everyone in Chicago refers to southern Illinoisans as "downstate Republicans." The same thing is said by people in Gary, Indiana about their downstate voters. It's partly true, but if you go far enough south in either state, you run across a lot of Democrats.



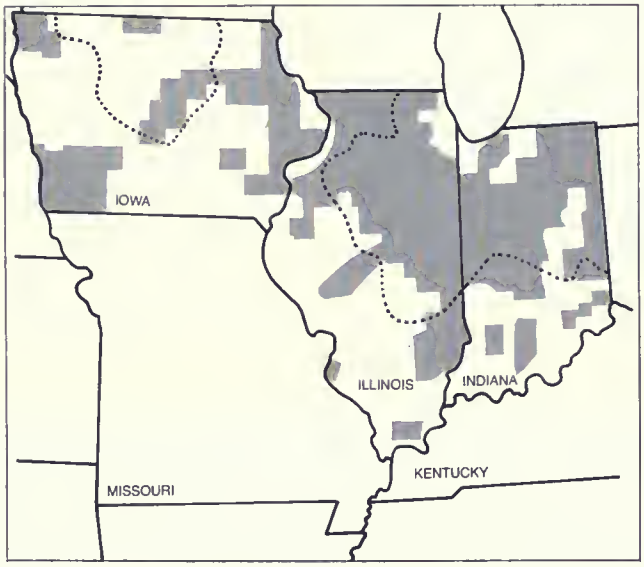
A. The dotted line indicates the southern edge of the last ice sheet. The shaded area indicates the area of the highest density of grain elevators with capacities of at least 400,000 tons.

Going over the last ten presidential elections, forty years' worth, it's clear that some counties go for Republican candidates over 90 percent of the time. Other counties go for Democrat candidates over 90 percent of the time. Many counties waffle back and forth. If you plot the counties that vote Republican 90 percent of the time or more on a map (Map B), in Illinois and Indiana most Republicans end up under the old glacial ice, and most Democrats outside of it. This excludes, of course, the densely populated urban counties of Cook (Chicago) in Illinois and Lake (Gary) in Indiana.

This fits the stereotypes of these two parties. If you

have a farm that's on good land, and you're doing well, you want very little government mucking around, and you probably oppose heavy government spending. You vote for the Republicans. If things aren't quite so good, you may be more partial to the government helping out, and you want the kinds of programs usually identified with the Democrats.

It makes a pretty neat story except for Iowa, where it doesn't work at all. Iowa is very heavily Republican throughout. Only five counties ever record many Democratic votes—two of them are way outside the glaciated area, and two are at the edge. No county in Iowa ever votes Democratic as high as 90 percent of the time. All but three of the strongest Republican counties are outside the crop-rich area also.



B. The dotted line indicates the southern edge of the last ice sheet. The shaded areas indicate counties in Iowa, Illinois, and Indiana that have voted Republican at least 90% of the time in the last 10 presidential elections.

Obviously there are many reasons people vote for candidates. With the much publicized current crisis in the farming communities all over Iowa, it's going to be interesting to plot the results of the election of 1988 on this map. Perhaps those with the glacially enriched land may pop out as still solid Republicans, and the rest of Iowa will join downstate Illinoisans and Hoosiers as Democrats.

About twenty years ago many geologists predicted that small changes they were measuring in seawater composition and temperature, along with other signs, warned that a fifth advance of the North American glacier was only 8,000 years away—a long time in our lives, but geologically not very long at all. Clouds carry water from the oceans onto the lands. When this water, falling as snow or rain, becomes converted to permanent ice and does not return to the ocean again, sea level gradually falls. Countries like the U.S.A., Canada, and the U.S.S.R. would gradually suffer food shortages as the result of shorter growing seasons. The crisis for human populations would be worse than any natural disaster ever known. If you polled the same experts today, they wouldn't be quite so sure about this prediction.

It turns out that there is a geological force no one had reckoned with before—huge human populations using fossil fuels. As fuels are burned to drive automobiles, heat and cool houses, cook food, heat water, and run industries, the biggest combustion product, carbon dioxide, is being released into the atmosphere. Although colorless, it acts like a filter for the sun's rays to build up the heat content of the air—little by little.

Right now, no one knows for certain, but mankind might actually have stopped the next glacial advance by substituting in its place a heating trend. Don't count your blessings. The warmup could run wild in the opposite direction causing hotter climates in many places in the world, changing rainfall patterns, reducing crop yields in North America, no matter how good the soil. Worse yet, the remaining ice caps in the Arctic and Antarctic would partly melt, raising sea levels to wipe out such places as most of New York City, all of Florida, much of Mississippi, Alabama, Texas, Louisiana, and Central California. Southern Illinois, for example, would become a seaport. There are some signs that this process is starting.

The earth sits at a balance point, oscillating between ice ages and warm ages. Human beings, although relatively little creatures, may be enough in total to tip things in the direction of a hotter age. If it starts along that path there will be a lot of changes—not only in voting patterns. FM

FIELD MUSEUM TOURS

Kenya Tanzania Safari

February 20 to March 10, 1988
$5,245 per person
Leader: Audrey Faden

February 20: Your safari begins when you board your British Airways flight to London this evening.

February 21: Arrive London's Heathrow Airport this morning. You will be met and transferred to the Sheraton Skyline Hotel, where day-rooms will be provided until your British Airways flight to Nairobi this evening.

February 22: Upon arrival in Nairobi, you will be met and transferred to the luxurious Norfolk Hotel—a famous colonial landmark and one-time haunt of Teddy Roosevelt, Ernest Hemingway, and Robert Ruark. This afternoon, enjoy a half-day tour of Nairobi, visiting the colorful African market, the unique Kenyatta Conference Center, Nairobi University, and the famed National Museum, known for its superb natural history collection and watercolors by Joy Adamson. Continue your tour by driving through the suburb of Karen, where you will see Isak Dinesen's original home, now a museum. This evening there is a welcome cocktail party and dinner at the Norfolk, with guests of the East African Wildlife Society.

February 23: Today you head toward the famed Tsavo West National Park, Kenya's largest national park. View game through the park before arriving at Kilaguni Lodge for lunch. From the lodge, watch the game come to the nearby waterhole. After lunch, go out in search of the great elephant herds. Your drive takes you to Mzima Springs, where large pools of clear spring water surface at the rate of 50 million gallons a day. Occasionally hippos can be viewed from the tank and cormorants swim by.

February 24: Today you drive to Amboseli National Park, justly famous for its big game and superb views of Kilimanjaro. The 150 square miles of park embody four main wildlife habitats including open plains, acacia woodland, scrub brush, and freshwater swamps. Spend the afternoon viewing animals such as wildebeest, zebra, giraffe, lion, cheetah, elephant, and rhino. Amboseli Serena Lodge.

February 25: Start the day with a dawn game drive in this beautiful park. Early morning is also the best time to view Kilimanjaro before the clouds build up over the summit. Game drive in the late afternoon—the best time to see lion and cheetah as they begin to stir from the shade.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

February 26: Today you drive to Tanzania via the Namanga border, passing through minimal immigration formalities. Continue on to Gibbs Farm, a small, quaint farm in the midst of coffee plantations.

February 27: Today transfer to Ndutu Safari Lodge, situated on the shores of Lake Lgarya near the southeastern corner of Serengeti National Park. Here you will enjoy game-viewing drives both morning and afternoon.

February 28: Today you have game-viewing drives both morning and afternoon to explore the vast Serengeti plains. Here millions of wildebeest and zebra mill across the plains, seeking fresh grasses. You see large prides of lion, perhaps a leopard resting in a tree, groups of hyena, a mother cheetah teaching her cubs to hunt, giraffe, gazelle, topi, and kongoni—the list is endless. Ndutu Safari Lodge.

February 29: This morning you will drive into the Olduvai Gorge, the site of Dr. and Mrs. L. S. B. Leakey's famous discovery of the fossil he called *"Zinjanthropus boisei"* (now classified *Australopithecus boisei*). Here you will enjoy a visit to the small but very informative museum and a short talk by one of Mrs. Leakey's assistants, who will escort you to the site of the *"Zinj"* discovery. Continue on to one of the natural wonders of the world, the Ngorongoro Crater, a caldera created by the prehistoric collapse of a volcano cone. On the crater floor, herds of typical plains mammals live out their destinies: buffalo, zebra, wildebeest, Grant's Gazelle, Thomson's Gazelle, lion, and hyena. Ngorongoro Wildlife Lodge.

March 1: Today we spend down in the crater, tracking and photographing the animals. This great caldera contains some of Africa's finest black-maned lion. Rhino can be seen with calves, and waterbuck appear not to notice the visitors, enabling photographers to shoot at ease. On the lake in the middle of the crater, you can watch thousands of flamingos.

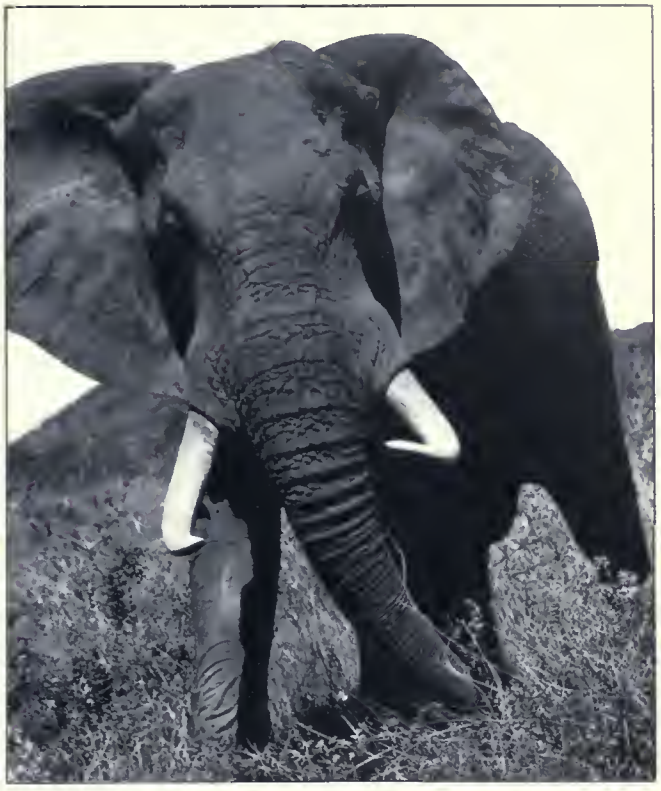
March 2: Descend into the crater once more early this morning for your last game drive here. Later depart to Lake Manyara Hotel, set on the edge of the Great Rift Valley and overlooking Lake Manyara National Park.

March 3: Enjoy a full day exploring the Lake Manyara National Park. This park contains five vegetation zones, thus supporting a large variety of fauna. Notable are the elephant herds and the tree-climbing lions.

March 4: Drive to the Namanga border where your Kenyan drivers will meet you for the drive back to Nairobi.

March 5: This morning you head northwest through undulating Kikuyu farming country, reaching the Aberdare Country Club in time for lunch. Transfer to special club vehicles for your game run to the Ark, which will take you into a deep forested area alive with some of the finest game viewing in Kenya. Driving along the animal trails and paths, you may suddenly come upon elephant, rhino, giant forest hog, Cape buffalo, waterbuck, bushbuck, warthog, colobus monkey, cerval cat, leopard, and perhaps the bongo antelope. The Ark is 'berthed' over a waterhole where the animals come to drink. From an underground dungeon you have an eye-to-eye view of this constantly changing scenario. Darkness descends, but floodlights permit game viewing well into the early morning hours!

March 6: Return to the Aberdare Country Club through the forest and clearings bright with clear morning light. Your safari driver will be at the club to greet you and you head north along



the slopes of Mt. Kenya, then continue on, descending nearly 6,000 feet, passing through the town of Isiolo where your vehicle will suddenly be surrounded by smiling Kenyans holding out wares for you to buy, such as copper bracelets, necklaces, and bangles. Bargain away if you wish, it's expected. View game as you drive through Samburu Game Reserve to the lovely Samburu River Lodge, located on the Uaso Nyiro River.

March 7: Today you have both morning and afternoon game viewing of Samburu's typically 'northern' game—reticulated giraffe, Grevy's zebra, graceful long-necked gerenuk, Somali ostrich and vulturine guinea fowl, none of which you will see further south. Samburu is also a very good park for elephant and the elusive leopard. It is an excellent place for the photographer, with the park's vivid colors and the contrasts between sky, bush, and sand. Bird enthusiasts will be well rewarded with over 300 species, including the martial eagle, in this reserve.

March 8: Board minibus and drive to the famous Mount Kenya Safari Club. Here you have the remainder of the day to luxuriate at this private club made famous by the late William Holden. There is golf, tennis, heated swimming pool, horseback riding, two lovely shops, a beauty salon, sauna, and many attractive rooms set aside for drinking tea or something stronger. The view of Mount Kenya is awesome as are the finely manicured grounds.

March 9: Drive back to Nairobi where rooms will be provided at the Norfolk Hotel until your transfer to the airport for your flight to London.

March 10: Arrive London, where you will connect with your British Airways flight to Chicago arriving later the same day.

This tour will be operated by Abercrombie & Kent.

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

October 1987

Peking Puppet Theatre
October 17
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COVER

Japanese inro, from the Carl and Jeanette Kroch Collection. See pages 22-30. Photo by Ron Testa and Sophia Anastasiou-Wasik.

Parking During Bears' Home Games

Museum visitors can come to Field Museum by car and park at the adjacent lots even on days when the Chicago Bears are playing at Soldier Field. Parking is available on those days for a $5.00 fee at the North Lot, the East Lot, or the Soldier Field Lot. Home games in October are October 11 and 18.

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EVENTS

The Peking Puppet Theatre

Saturday, October 17, 2:00pm
James Simpson Theatre, West Entrance

IMAGINE THAT YOU ARE SITTING in a darkened theatre watching life-sized puppets, dressed in dazzling bright costumes, as they enact the age-old tale of the battle between the Eight Immortals and the Dragon Demon. Or perhaps you are enchanted by the graceful, yet comic, story of the Crane and the Turtle. Maybe you are delighted by the pageantry and passion of the Lion Dance. If these tales intrigue you, you are one of the thousands the world over who are fans of The Peking Puppet Theatre.

This unique theatre, from the People's Republic of China, is now making its first nationwide tour of the United States. The master puppeteers of this craft have passed on the tradition of puppetry from parent to child for 1,000 years, preserving a vast repertoire of Chinese legends and folktales.

P87201 THE PUPPET THEATRE
Tickets: $12:00 (Members: $10.00)
Seating is general admission. Theatre doors open one hour prior to performance.

Registration by mail

Please use coupon on the back of this page to order tickets by mail. Be sure to complete the requested information and make checks payable to Field Museum. Tickets will be mailed upon receipt of check. Refunds are made only if the program is sold out.

By Phone

Register by phone with American Express/Visa/MasterCard/ Discover. Call Monday through Friday, 9:00am-4:00pm. (312) 322-8854.

Pawnee Earth Lodge 10th Anniversary

Thursday through Sunday
October 22 - 25

JOIN FIELD MUSEUM in celebrating the 10th anniversary of the opening of the Pawnee earth lodge, a life-size replica of a traditional Pawnee home and ceremonial center. Festivities center around the visit of the Pawnee elders who advised in the planning and construction of the earth lodge in 1977. During the four-day celebration, elders meet with visitors in the lodge and craft people demonstrate traditional crafts in the exhibit areas. Dance performances will be at 10:30am on Thursday and Friday, and 2:00pm on Saturday and Sunday. All events are free with Museum admission.

E·V·E·N·T·S

October Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the Weekend Programs Sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

OCTOBER

4 12:00noon: *Brontosaurus Story* (tour). Look at some of the newest discoveries about the "thunder lizard" and other larger dinosaurs.

10 1:30pm: *Tibet Today* (slide lecture and tour). Slide lecture shows Lhasa and other towns now open to tourists, followed by a tour of our Tibet collection.

10 2:00pm: *Malvina Hoffman: Portraits in Bronze* (slide lecture). Slide lecture on the life and works of Malvina Hoffman, concentrating on the Portraits of Mankind Collection commissioned by Field Museum.

These programs are free with Museum admission and no tickets are required.

Hall Interpreters Program

Thursdays through Sundays
October

TAKE A HANDS-ON JOURNEY through Field Museum this fall. Unearth the links to our past while participating in an archeological dig, learn a string game from the Arctic, discover Native American tools and their uses, and create a coil basket. Hall interpreters, located throughout the exhibits, help you and your friends experience the wonders of the world. Compare the teeth of shark and elephant, decipher hieroglyphs, and discover dinosaur tracks and their tales. These exciting programs are available to all Museum visitors Thursday through Sunday, and on Columbus Day (Oct. 12). Please consult video monitors throughout the Museum for activity locations. This program is partially supported by the Joyce Foundation and the Lloyd A. Fry Foundation.

World Music Program

Weekends in October
1:00pm and 3:00pm

Join us for live musical demonstrations and informal discussions with the artists.

October 3, 4 — *1:00pm*—Chinese Music Society of North America demonstrating instruments of the Chinese orchestra.
3:00pm—Light Henry Huff and his harp.

October 10, 11 — *1:00pm*—Chinese Music Society of North America demonstrating instruments of the Chinese orchestra.

October 17 — *1:00 and 3:00pm*—Raices del Ande, playing Latin American folk music.

October 24, 25 — *1:00pm*—Keith Eric, Jamaican songs and stories
3:00pm—Light Henry Huff and his harp.

The World Music Program is supported by the Kenneth and Harle Montogomery Foundation and a grant from City Arts III/IV, Chicago Office of Fine Arts, Department of Cultural Affairs.

Peking Puppet Theatre

Registration

Be sure to complete all requested information on this ticket application. If your request is received less than one week before the program, tickets will be held in your name at the West Entrance box office. Please make checks payble to Field Museum. Tickets will be mailed upon receipt of check. Refunds will be made only if the program is sold out.

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Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Program	#Member Tickets ($10.00 ea.)	#Nonmember Tickets ($12.00 ea.)	Total Tickets	Amount Enclosed
P87201 The Peking Puppet Theatre				
			Total	

☐ Scholarship requested

E·V·E·N·T·S

Edward E. Ayer Series

Thursdays in October
1:30 p.m., James Simpson Theatre
Lectures are free and refreshments are served.

THE EDWARD E. AYER SERIES continues through October at 1:30 p.m. on Thursdays. The narrated slide series features programs on the island of Yap, ancient Egypt, New Zealand, Ethiopia, and local birds.

☐ October 1
"Yap—The Island of Stone Money"
Robert Pickering, Anthropological Consultant

Yap is a tiny island in the Pacific, located between Guam and New Guinea. An old and traditional culture, the men fish and the women farm. Meet these ancient people known for their seafaring skills and the use of enormous stone wheels for money.

☐ October 8
"The Pyramids of Egypt"
Frank Yurco, Doctoral Candidate in Egyptology, Department of Near Eastern Languages and Civilizations, University of Chicago

As they dominate the horizon of Cairo, so pyramids dominate the popular view of ancient Egypt. Learn why these majestic monuments were really built and about the fascinating culture of the ancient people who built them.

☐ October 15
"New Zealand: A Geologic Journey"
Paul Sipiera, Associate Professor, Department of Physical Sciences, Harper College

New Zealand is a country of diverse geology occurring in a small area. Explore the glaciers of Mt. Cook, the depths of Milford Sound, the Moeraki Boulders, and the Rotorua geysers and hot springs. From the active volcanoes of North Island to the serene beauty of the southern Alps on South Island, discover the mystique of the "Land of the Long White Cloud."

☐ October 22
"High in the Horn of Africa"
William Burger, Curator, Department of Botany, Field Museum

The landscapes of eastern Ethiopia range from dry desert grasslands and thornbush to high alpine meadows. This broad range of environments is home to a great variety of plants and animals and two very distinct groups of people: nomadic herders and settled farmers. Join us for a close look at the natural history of this intriguing land.

☐ October 29
"Chicagoland Birds"
Peter Dring, Naturalist, Cook County Forest Preserve District

The Chicago area is host to an abundance of different birds throughout the year. Meet some of the permanent residents and seasonal migrants. Discover the habits and habitats of these sometimes fleeting but always fascinating creatures.

After Hours: Films at the Field

A free international film series

After Hours—Films at the Field continues through October. This month the free Friday evening films feature Indians of the Americas. Light fare and beverages are available from Convito Italiano beginning at 4:30 p.m. Films start at 6:00 p.m.

☐ October 9
"Aguirre, The Wrath of God"
1973. 94 minutes. Color. Germany. Director: Werner Herzog. German with English subtitles.

In the mid-1500s, a Spanish expedition searching for the mythical city of Eldorado detaches a small party to explore an Amazon tributary but they never return. Herzog uses this obscure historical incident to chronicle the greedy lawlessness of the conquistadors who ravaged South America and Indian cultures in their lust for land and gold. Klaus Kinski delivers a powerful performance creating the dark comic character of Aguirre, who dreams of stealing the entire continent for himself.

"How Hollywood Wins The West"
1980. 30 minutes. Color. United States. Producers: Robert Hagopian, Phil Lucas. Narrator: Will Sampson.

This is a part of a series of documentary films dealing with the one-sided presentation of Indian history despite the frequent use of Indian culture in Hollywood films.

☐ October 16
"Little Big Man"
1970. 137 minutes. Color. United States. Director: Arthur Penn.

Little Big Man follows the typical story line used in the past by so many Hollywood films about Indians: boy's parents are killed by Indians as they are traveling west; Indians adopt the young boy and teach him their ways and make him brave and honorable. Despite the obvious stereotyping and questionable history, Dustin Hoffman and the "tongue in cheek" tone make this one of the first feature films from Hollywood that attempts to portray Indians as real people.

"Harold of Orange"
1984. 30 minutes. Color. United States. Written by: Jim Vizenor.

A parody of modern Indian-White relations in which a modern-day Indian "trickster" succeeds at getting funding for his reservation projects. This short film pokes fun at the way stereotypes of Indians still persist even among the "good liberals" wanting to help the disadvantaged Indians.

☐ October 23
"The Chicago Story"
1950. 20 minutes. Black and white. Filmed by the U.S. Bureau of Indian Affairs.

In the 1950s, the U.S. government relocated thousands of Indians from their reservations into larger cities. They were to be assimilated into the mainstream American culture and learn trades. This classic piece of governmental propaganda shows how wonderful city life will be for the Indians.

Continued ▷

E·V·E·N·T·S

☐ October 23

"Dreamspeaker"

1978. 75 minutes. Color. Canada. Director: Claude Jutra.

This award-winning film from Canada tells of a young boy with serious emotional problems. He runs away from home and encounters an Indian medicine man, who tries to heal the boy by using tribal methods. The boy, however, decides to end his life. The film looks at traditional Indian ways and the Western ways that are threatening to take their place.

☐ October 30

"Windwalker"

1980. 108 minutes. Color. United States. Director: Kieth Merrill. Cheyenne and Crow languages with English subtitles.

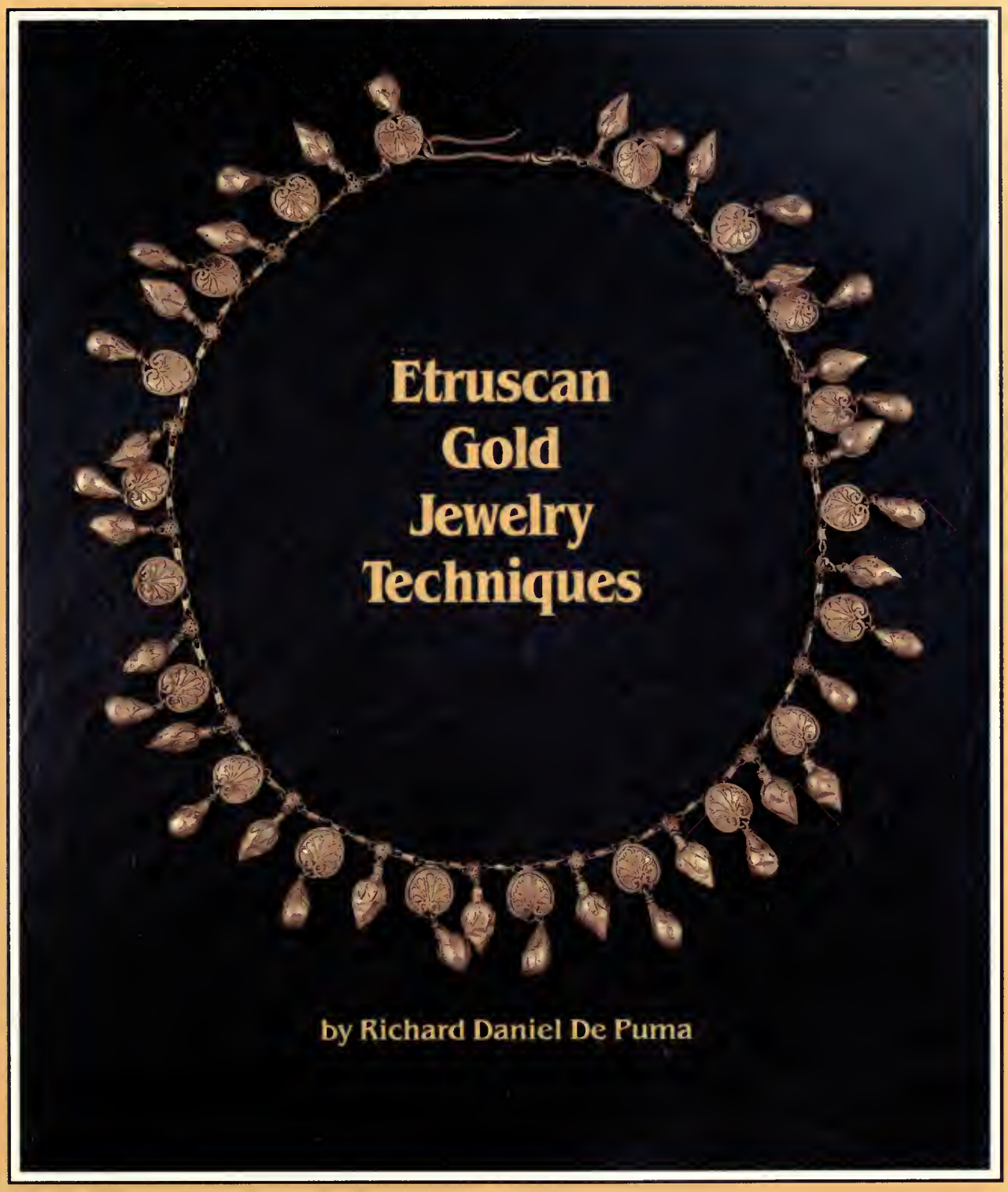
This beautifully filmed feature provides an unusually authentic treatment of Indian culture. Except for an occasional voice-over narration in English, all spoken language is in Crow or Cheyenne. The action takes place in the 18th century and there are no non-Indian characters. All the actors are Indian except for Trevor Howard, as the old Cheyenne man, Windwalker, who recounts his life as he lies dying.

"The Spirit of the Navajo"

1966. 20 minutes. Black and white. Silent. United States. Filmed by: Maxine and Mary Jane Tsotie.

This film is part of a film project where Navajos were taught the technology of film-making and encouraged to choose their own subjects. Two women filmed their grandfather, a medicine man, gathering roots and herbs for a ceremony.

Scene from "Dreamspeaker," showing October 23.



1. Etruscan gold necklace, 4th or 3rd century, B.C. Cat. no. 239188. Sophia Anastasiou-Wasik 110412

2. Etruscan gold necklace, 4th or 3rd century, B.C. Cat. no. 239188 (detail). Sophia Anastasiou-Wasik 110409C

Since 1828 people have been fascinated by the unexpected refinement of ancient Etruscan jewelry. At Vulci that year, an Italian tenant farmer accidentally destroyed the roof of a subterranean Etruscan tomb with his plow. The owner of the property was Lucien Bonaparte, Prince of Canino and brother of Napoleon. This fortuitous discovery encouraged Bonaparte to explore further; before long, numerous Etruscan tombs were being mined. Soon the Princess of Canino appeared at elegant parties wearing the rich harvest of Etruscan jewelry from the tombs on her husband's lands.

Such discoveries encouraged continued exploration. Throughout the 19th century the splendid contents of more and more Etruscan tombs were brought to light: the Regolini-Galassi Tomb at Cerveteri in 1836, the Isis Tomb at Vulci in 1839, the Barberini and Bernardini Tombs at Palestrina in 1855 and 1876, to name only the most famous. Although these tombs, not to mention the important series of painted chamber-tombs at Tarquinia, yielded hundreds of precious vases, bronzes, and ivories, it was their gold jewelry that captured public attention.

What is it about this jewelry that so fascinates us? Certainly, antiquity is one factor: The Etruscans dominated central Italy from *ca.* 700 B.C. until their absorption by the Romans beginning in the 4th century B.C. Their finest jewelry was produced *ca.* 650 B.C. but much of it is as fresh as the day it was buried. Other qualities of the jewelry are its originality of form, its inventive decorative motifs or its ornamental and apotropaic (intended to turn away evil) functions. Many of us are immediately drawn to anything made of gold, a metal which has always excited human passions. But for me and others who enjoy studying Etruscan jewelry, it is the degree of technical refinement which elicits our greatest admiration. Obviously, any of these features could be the subject of lengthy study. A thorough discussion of Etruscan jewelry would have to deal with all of them. Here I will treat only the major aspects of Etruscan gold jewelry techniques. Examples from Field Museum's fine collection, mostly acquired between 1895 and 1912 but still virtually unpublished, will illustrate the various techniques.

By way of introduction, let me say something about gold itself. Pure gold is the most chemically stable, malleable, and ductile of all metals. Its chemical stability ensures that its characteristic glitter will not fade with time. Its malleability was well known to the ancients: Pliny the Elder, the first-century Roman encyclopedist, tells us that a single ounce of gold could be beaten into 750 sheets or "leaves," each about three inches square (a total area of more than 46 square feet!). Roman craftsmen produced leaves only 0.0002mm (about 1/127,000") thick, a significant improvement on the 0.001mm foils of the Egyptians. Today, through a combination of beating and rolling, sophisticated machines produce incredibly thin leaves approaching thicknesses of only 0.00001mm.

The astonishing ductility of pure gold allows it to be drawn into fine wires. Again, Pliny mentions having seen Nero's mother, the Empress Agrippina (A.D. 15-59), dressed in "cloth of gold" woven from thread-like filaments of the metal. In our own time, a single gram of gold has been drawn into a fine wire approximately 3.2km (2 miles) long.

These versatile properties of pure gold are seriously diminished by impurities. Native gold is never pure, although gold of 99.9 percent purity was discovered in California and occurs occasionally elsewhere. Typically, native gold contains some silver and copper. Ancient jewelers preferred nearly-pure gold because it is more malleable, more ductile, and has a higher melting point. In general, chemical analyses for pieces of ancient jewelry show that they have a very high gold

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Richard Daniel De Puma is professor of classical archaeology in the School of Art and Art History, University of Iowa, and a Field Museum research associate. He recently published Etruscan Tomb-Groups: Ancient Pottery and Bronzes in Chicago's Field Museum of Natural History *and a book on engraved Etruscan mirrors.*

content, unlike the more durable, but less pure, gold alloys used by modern jewelers. Relatively few pieces of Etruscan jewelry have been analyzed, but there appears to be a high percentage of silver in pieces produced in the 7th century B.C.

Probably early humans first noticed gold sand or nuggets which had washed down to a river bed from a higher vein. This "alluvial gold" is the easiest to recover and requires no refining. Man's greed for gold inevitably led to the more difficult task of mining "reef gold"—uneven deposits of the metal often imbedded in quartz veins.

Etruria, the heartland of Etruscan civilization, is bordered on the north by the Arno River and on the east and south by the Tiber. In land area it is about the size of New Hampshire. But, despite its small size, it possessed the central Mediterranean's richest supplies of tin, copper, and iron ore. These resources, coupled with Etruria's fertile farmland, ensured the growth of a major civilization on its soil.

By Roman times Italy's gold supply was virtually depleted. Five thousand Romans mined a significant deposit at Victumulae, near modern Vercelli (midway between Turin and Milan), but most Roman gold came from Spain. Although there is much evidence of earlier Etruscan mining operations, we are not certain of their sources of gold. Surely, alluvial deposits existed along the banks of Mignone and further north in the Pennine Alps, to which Etruscan culture spread. While the lands controlled by the Etruscans may not have been especially rich in gold, other supplies of the metal probably came from overseas in exchange for the copper, tin, iron ore, and agricultural products so eagerly purchased by the Greeks and Phoenicians.

What evidence do we have for understanding the technical processes in the creation of Etruscan jewelry? There is no extant Etruscan literature on the subject. Greek and Latin authors speak of jewelry, but they are often vague or inaccurate and usually silent on technical matters. Only one fragmentary technical treatise survives: the so-called "Leyden Papyrus X" from 4th century A.D. Egypt.

Have the remains of an Etruscan goldworking establishment been discovered? Not yet. We have a few goldsmith's tools and implements, often from other cultures but probably similar to ones employed by ancient jewelers everywhere. Normally, these merely corroborate evidence from the best source of all: the surviving jewelry itself. Most of our knowledge of Etruscan goldsmithing techniques is from close examination of the actual jewelry, often with microscope, spectroscope, or electron microprobe. Modern attempts to duplicate various features have proved to be especially helpful. A survey of these findings is now in order.

Decorative Techniques: Repoussé and Chasing

The simplest and oldest gold decorative technique involves the hammering, stamping, or punching of a thin gold sheet. Since gold is so malleable, this rarely requires the effort suggested by the word "hammering." In fact, a gentle tapping is usually sufficient. Repoussé is the French term used to describe the pushing out of forms from the back of a sheet of gold. Thus, relief elements are raised on the front of the sheet. Often a carved punch or stamp (made of bronze, wood, bone, etc.) can be used to create a series of the same decorative elements. An excellent example of this kind of work appears on a 7th century B.C. Etruscan gold pendant, the earliest article of Etruscan jewelry in Field Museum (no. 239203), shown in figure 3, below. A piece of sheet gold was cut into a "figure-eight" shape then, after being decorated, was bent around a short bronze tube which formed the suspension channel. The two halves of the "figure-eight" were then "stitched" together with a flat gold wire, some sections of which still remain. Decoration consists of five bosses raised on each side and numerous fine chasings. Chased lines (simply incised rather than engraved) form chevrons on the suspension tube, zigzags, and concentric circles around the pendant's perimeter and the five bosses, four small zigzag crosses, and a group of four concentric squares.

3. Etruscan gold pendant, 7th century B.C. Cat. no. 239203. R. D. De Puma

Examples of repoussé decoration made from a stamp may be seen on a series of small gold discs (nos. 239137-1 through 4), figure 4. Each is stamped with a wreath-like frame enclosing a youthful male head shown in left profile. These are identical and obviously produced with the same stamp. Precise parallels for the motif appear on the related series from Vulci now in the Vatican Museums. It is quite likely that the examples in Field Museum were made in the same workshop and probably came from Vulci. Both series date to *ca.* 425-400 B.C.

A logical extension of the repoussé technique is the stamping of symmetrical halves of an element, cutting them out of their gold sheet and then joining the two halves to form a single, hollow element in the round. The many fanciful creatures that parade across much of Etruscan jewelry were created in this way. Often the seams of the two halves are hidden by an attached wire or row of granulation but, under magnification, they are usually visible. The tiny gold pendants of a fine necklace from the 4th or 3rd century B.C. (no. 239188), shown in figures 1 and 2, were produced in this manner. In several instances the pendants have been dented, with a resulting rupture of the seams. A set of Hellenistic bronze stamps for making similar jewelry elements was excavated at Galjûb in Egypt.

4. Gold discs with repoussé decoration, *ca.* 425-400 B.C. Cat. nos. 239137, 1-4. Sophia Anastasiou-Wasik 110413

Filigree

Filigree may be defined as the process of decorating a piece of jewelry with metallic wires, cut and shaped to form various motifs or designs. Obviously, the significant feature here is wire. How did the Etruscans produce fine gold wires? Microscopic examination of a number of ancient samples has suggested several possibilities to modern researchers. In a valuable study, Andrew Oddy* demonstrated four possible methods of producing fine gold wires. A drawing adapted from Oddy's microphotographs will help to clarify these processes.

The most obvious method is simply to pound a piece of gold into a roughly elongated wire (fig. 5, A). "Hammering" produces a solid but irregular cross-section as well as an uneven surface and diameter. Some of these problems could be minimized by rolling the irregular wire between two hard, flat surfaces. A second process, "block-twisting," begins with a gold rod that is square in section (B1). Gold rods can easily be made from a gold sheet by cutting small strips whose widths equal the sheet's thickness. The rods are twisted tightly (B2-3) and then rolled between flat surfaces to produce wires with round cross-sections and uniform diameters (B4). Unlike the hammered wires, these have smooth surfaces and four spiral grooves which may be detected under magnification.

The last two methods involve gold strips that are pulled through a draw-plate, a metal die pierced with graduated, tapering holes. There has been considerable discussion about when draw-plates were first used and whether such devices were known to the ancients. Although the question cannot be answered to everyone's satisfaction, recent experiments have demonstrated that wire can be drawn through a "soft" draw-plate made of the same metal as the wire and that the characteristic parallel scratches made by a metal draw-plate not only appear on many authentic ancient wires but can be duplicated by easier methods than once suggested.

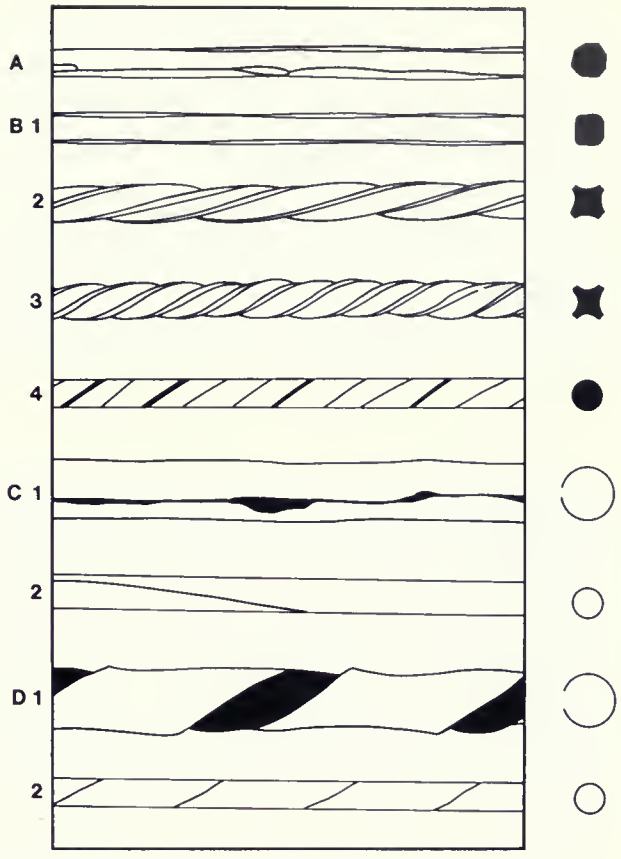
To return to methods of making gold wire, the third process, "strip-drawing," requires that a small strip of gold be pulled through a simple draw-plate. This curls the strip into a hollow tube whose seams overlap but may be irregular (C1). Further draws through smaller holes reduce the diameter and eventually produce a closed, round tube with a single longitudinal seam (C2). "Strip-twisting," the fourth method, is clearly related to "strip-drawing." Here a

* "*The Production of Gold Wire in Antiquity*" in Gold Bulletin *10, 3 (1977) 79-87.*

strip of gold is first twisted over a previously made wire and then removed. This helix ribbon reminds one of an undone paper drinking straw (D1). As the helix is twisted tighter, the seams touch, then overlap while the diameter decreases. The wire may be smoothed further by pulling it through a draw-plate. The final product is essentially uniform, is hollow with a round section, and has a single helical seam (D2). All four methods, but especially the last three, produce wires which are round in section. Two such wires can be twisted around each other to form a cable or rope; two "ropes" twisted in opposite directions then placed beside each other and aligned create a "braid." Wire ropes and braids are clearly visible along the edges of several Field Museum earrings from the 4th and 3rd centuries B.C. (nos. 239066, 239068), figures 6, 7. The ancients also used "beaded" wire, but exactly how this was produced is debated. In fact, the word filigree, which comes from Latin *filum* ("wire") and *granum* ("grain" or "bead"), may allude to beaded decorative wires.

The Etruscans used their decorative gold wires in a variety of ways. On several 7th century B.C. bracelets from Marsigliana*, serpentine wires form lace-like bands that alternate with narrow ribbons of gold. The openwork of filigree of these bracelets makes them among the most delicate and intricate articles from this rich period. It is far more common for wires to decorate the surfaces of jewelry, especially earrings, already formed by the repoussé process described earlier. A good example (no. 239066) shows two reclining repoussé lions at the top of each earring; their tails are made of tiny twisted wires. Scores of twisted wires are arranged to form various designs on other earrings (*e.g.*, no. 239068). On still others, small coiled wires (made by simply winding the wire tightly around a rod and then sliding it off to form a spiral) are arranged in floral patterns or flattened to form a looped border (no. 239067), figure 8. Wires are also often used to form "loop-in-loop" chains like the complex braided necklace, no. 239163, figure 9.

The Etruscans, then, used filigree in four basic ways: (1) to form an openwork border (*e.g.*, Marsigliana bracelets); (2) to create independent design elements on a gold background or repoussé relief (*e.g.*, nos. 239188, 239066, 239068); (3) to outline or frame independent elements (no. 239067 and most earrings of this type); (4) to form loop-in-loop chains of varying



5. Several types of gold wires, as fashioned by Etruscan artisans (see text).

complexity (no. 239163). Of course, a single piece of jewelry often combines several of these basic applications.

Granulation

Granulation describes the decoration of metal objects with tiny metal spheres, or "grains." Of all the technical processes treated here it is the most characteristic of Etruscan jewelry and has caused the widest admiration, discussion, and controversy. The technique was developed *ca.* 2500 B.C. in the Near East and appears with varying degrees of quality in all the ancient Mediterranean cultures. The Etruscans probably learned about granulation from Eastern Greeks, but they quickly refined the technique and soon surpassed all others with the excellent quality of their granulated jewelry. My discussion of granulation is divided into three parts: first, how the grains were produced; second, how the grains were joined to the gold base; third, how granulation was used to decorate jewelry. The discussion is limited to gold, although silver granulation is also known.

*M. Cristofani, ed., L'Oro degli Etruschi (Novara, 1985), no. 47, pp. 107 and 266.

6. Pair of gold earrings, 4th or 3rd cent. B.C. Cat. no. 239066. R. D. De Puma

8. Pair of gold earrings, 4th or 3rd cent. B.C. Cat. no. 239067. R. D. De Puma

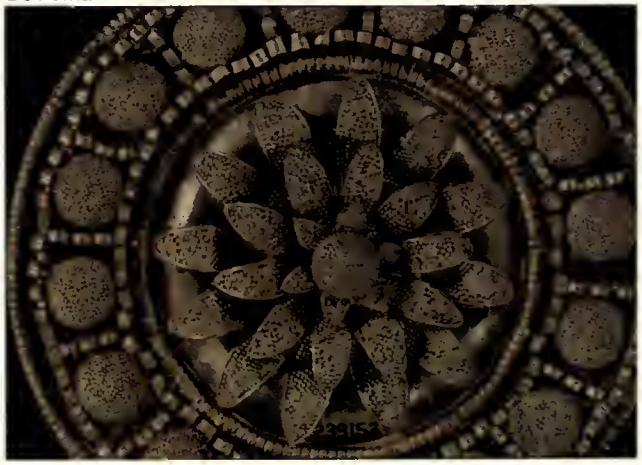
7. Pair of gold earrings, 4th or 3rd cent. B.C. Cat. no. 239068. R. D. De Puma

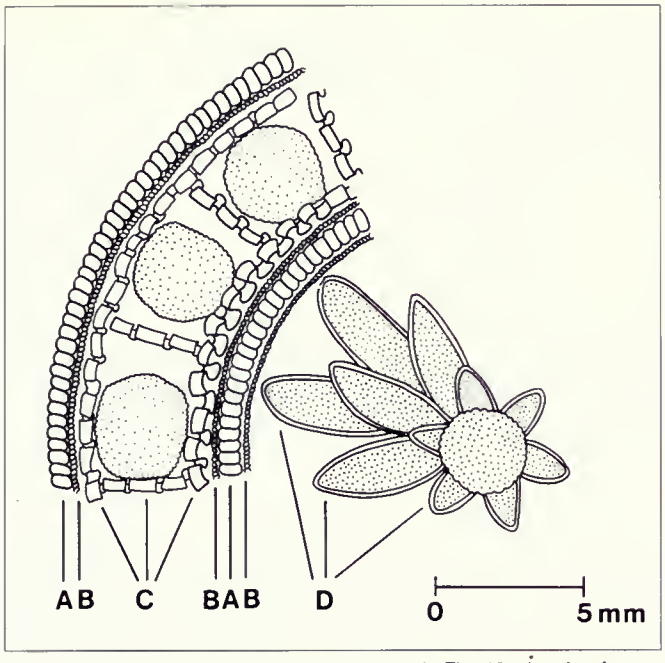
9. Braided gold necklace, Cat. no. 239163. R. D. De Puma

Etruscan gold grains are solid and usually near-perfect spheres. They range in size from *ca.* 0.5mm to less than 0.14mm in diameter. Some grains are so fine that they are frequently termed *pulviscolo*, or "dust" granulation. Those on the elegant gold disc ornament, possibly an earring (no. 239153), figure 10, are only 0.16mm in diameter or about 150 per inch and certainly qualify for this distinction. A larger and smaller pair of elaborate discs is in the Field Museum collection (nos. 239153-4), figure 12. All illustrate the incredible skill with which the ancient jeweler combined granulation with filigree (see drawing, figure 11).

How were such tiny grains produced? At first sight, one is amazed that ancient craftsmen could manufacture such minute but perfect spheres. Actually, their production is the easiest part of the operation, owing to a law of nature that makes small metal particles assume spherical shape when they melt. Two basic methods of achieving this were probably known to the ancients. First, one can pour a stream of molten gold onto a hard, flat surface or into cold water or into powdered charcoal. The process can be facilitated by pouring the stream through a broom of new birch twigs to help disperse the gold or by rapidly stirring the cold

10. Gold disc ornament, possibly an earring. Cat. no. 239153. R. D. De Puma





11. Schematic drawing of gold ornament in Fig. 10, showing four types of wire: A, "beaded" wire; B, "twisted" wire; C, flat serpentine wire placed vertically; D, plain wire. Stippling indicates "dust" granulation.

water. In any of these variations, the molten metal is broken up into small particles which cool quickly and form spheres of various sizes.

The second method is more complicated. One first cuts gold wire into small pieces of uniform size. These are then placed in a crucible where they are kept apart by layers of ash. When the crucible is heated the wire bits melt into spheres. This method requires more time and fuel but it is the only one which produces grains of uniform size. Grains made by one of the pouring methods would have to be sorted, but this could be accomplished easily with graduated sieves.

Soldering Processes

Having produced gold grains of various sizes, how did the Etruscans attach them to the jewelry they wished to decorate? Soldering each tiny sphere individually would, of course, be blindingly difficult. In fact, although metallic solder can be seen on granulated work from Egypt and other areas, it is not detectable on most Etruscan jewelry. Modern researchers now believe that a non-metallic solder was most likely used. In the "copper-salt process," for example, an animal or

12. Elaborate gold discs with fine granulation. Cat. nos. 239153-4. R. D. De Puma

fish glue was applied to the gold base (or "substitute") to be decorated. This could then be "dipped" into a container of grains of the desired size, or depending on the area to be decorated, the grains could be sprinkled onto the substrate. The grains adhering to the glued area could, if necessary, be adjusted at this point to form more precise patterns.

Mixed with the glue was a powdered copper compound such as malachite, whose Greek name *chrysokolla* means "gold-solder" or "gold-joiner." Malachite reacts violently when heated and can mar or even eat through thin metal; it had to be combined with other ingredients before it could safely be used to solder delicate jewelry. Pliny (*Natural History* XXXIII, 29, 93) records a gold-solder recipe which dilutes malachite with Cyprian verdigris (copper acetate pentahydrate, the product of bronze corrosion), *nitrum* (a compound of sodium carbonate, bicarbonate, chloride, and sulphate) and child's urine (probably used to thin the mixture; prepubescent urine is low in zinc). It is especially interesting that Pliny speaks of this formula as something foreign and whose name in Latin is *santerna*, a word which has been shown to be Etruscan in origin. It is almost certain that the same recipe or one very similar was used by the Etruscan goldsmiths who handed it down to the Romans of Pliny's time.

When the decorative patterns have been "drawn" with this special glue, the grains may be applied. Once the glue is dry the grains are secure; additional areas of the object may be decorated without disturbing the first application. When the completed piece is heated the organic glue carbonizes and releases water. The malachite (basic copper carbonate) becomes copper oxide which, at about 850°C, with the help of carbon from the glue, reduces to copper. It is this metallic copper which replaces the glue compound and solders the grains to the substrate. It is important to realize that diffusion of this metallic copper in the microscopic area between grain and contact point on the substrate results in a new alloy with a much lower melting point (about 890°C) than the grain or substrate proper (about 1,000°C). In other words, there is no danger that the grains themselves will melt before they are permanently fixed by the new copper alloy solder.

Electron microprobe analysis has recently demonstrated that the joins between grains and substrate on some 7th century B.C. Etruscan jewelry are indeed rich in copper. In the pieces sampled, the average alloy content for both grain and substrate was approximately 68 percent gold, 30 percent silver, and 1.3 percent copper; the joins, however, showed heavier concentrations of copper, as high as five percent. This proves that the copper-salt, non-metallic (or "colloid") soldering process described above was definitely used for at least some of the granulated jewelry made by the Etruscans during the 7th century. Unlike metallic soldering, a distinct advantage of this copper-salt method is that all the joining need not be done at one time. New areas of granulation or filigree may be added in several stages without harm to elements attached earlier. This feature is particularly important in the production of complex designs.

"Sintering" is another joining method proposed for Etruscan granulation. In this process grains are again attached to the substrate with glue, then the piece is heated until the glue volatizes. Finally, at a critical point, the gold surfaces begin to melt. If the piece is removed from the furnace at this time, before the grains themselves melt, joins will have formed between grains and substrate. These joins are not copper-enriched. Sintering requires rigorous temperature control and works only on objects with high gold content. The Etruscans may have known both this and the copper-salt process but, at this time, only the latter is proven.

Types of Granulation

Etruscan goldsmiths employed five types of granulation, often using more than one kind on the same piece. In "massed" granulation the grains form a scintillating background for figures in repoussé; sometimes this massing simply creates a textural difference to indicate hair or beard or to distinguish various parts of a complicated element such as a lotus blossom or to differentiate patterns in a complex design (nos. 239153-4). An excellent example of massed granulation appears on a 5th-century beaded necklace (no. 239189), figure 13. It is used to enliven the hair of alternating satyr and human heads; the smaller human heads are only 6.5mm tall. Less energetic Etruscan goldsmiths imitated the appearance of massed granulation with repoussé dots, especially in the 4th century.

"Silhouette" granulation uses masses of grains to form figures against a blank gold background. It is especially popular on 7th-century pins and rarely appears on later Etruscan jewelry. Such a pin (no. 239148), figure 14, in the Field Museum shows two swans rendered in silhouette granulation.

"Linear" granulation is by far the type most frequently used by the Etruscans. Here either single or, more often, double rows of grains form figures or

13. Beaded gold necklace, 5th cent. B.C. (detail). Cat. no. 239189. Sophia Anastasiou-Wasik 110409C

14. Seventh century gold pin, with swans rendered in silhouette granulation. Cat. no. 239148. R. D. De Puma

geometric designs. The rows may be joined directly to a flat substrate but typically follow tiny repoussé grooves. Linear granulation often articulates the three-dimensional gold animals perched on so many Orientalizing pieces or the hollow gold beads of objects like no. 239169. The gold beads on this last piece are only 8mm in diameter; yet each hemisphere is elaborately decorated with a frieze of palmettes and volutes executed in double-row linear granulation. Triple rows of grains are used for the biconical beads of another necklace (no. 239159) of *ca.* 650 B.C.

Two other types of granulation are not as common in Etruscan work: "Point" granulation is simply the use of isolated, usually large, grains to punctuate an individual element. Such treatment is most common on *a baule* ("valise-shaped") earrings such as those discussed earlier (nos. 239066-8). "Cluster" granulation uses grains set upon each other to build tiny pyramids. In its simplest form, three grains support a centrally placed fourth grain, the apex of the pyramid. Such clusters are usually combined with linear granulation and are often isolated from each other.

This brief outline of the basic techniques of Etruscan gold jewelry should, I hope, dispell some of the "mystery" so often associated with this art and the culture which produced it. At the same time, we cannot fail to be impressed with Etruscan goldsmith skills. Few ancient works can rival these for elegance of design and delicacy of execution. That point will remain true no matter how well we come to understand the various techniques. **FM**

WOVEN PORCUPINE QUILL DECORATION

Among Indians of the Canadian Northwest

by James W. VanStone
Curator of North American Archaeology and Ethnology

In 1971 Field Museum acquired a decorated cloth pouch for gun shot identified only as being from "Northwestern North America." It is in excellent condition and is ornamented with the extremely fine loom-woven quillwork designs characteristic of Athapaskan Indians of interior Alaska and northwestern Canada and the Cree-speaking peoples of western and northwestern Canada. Although this shot pouch lacks precise provenience, it has been of special interest because of its excellent condition and the fine quality of its workmanship. Indians of the northwest have always been considered among the finest native American craftsmen in the working of porcupine quills and one of the few peoples to have perfected the weaving technique with this material. There seemed little likelihood, however, that a more precise provenience could be determined for this particular specimen.

In 1985 a similar cloth shot pouch was seen in the collections of the Peabody Museum at Harvard University. The documentation for this pouch is sketchy, but it is said to have been collected among Cree Indians before 1819 by Roderick McKenzie and acquired by the Peabody Museum in 1890 from the American Antiquarian Society, of Worcester, Massachusetts. Although the Peabody Museum pouch is in relatively poor condition, it is sufficiently similar to the Field Museum pouch to suggest that both are of Cree manufacture.

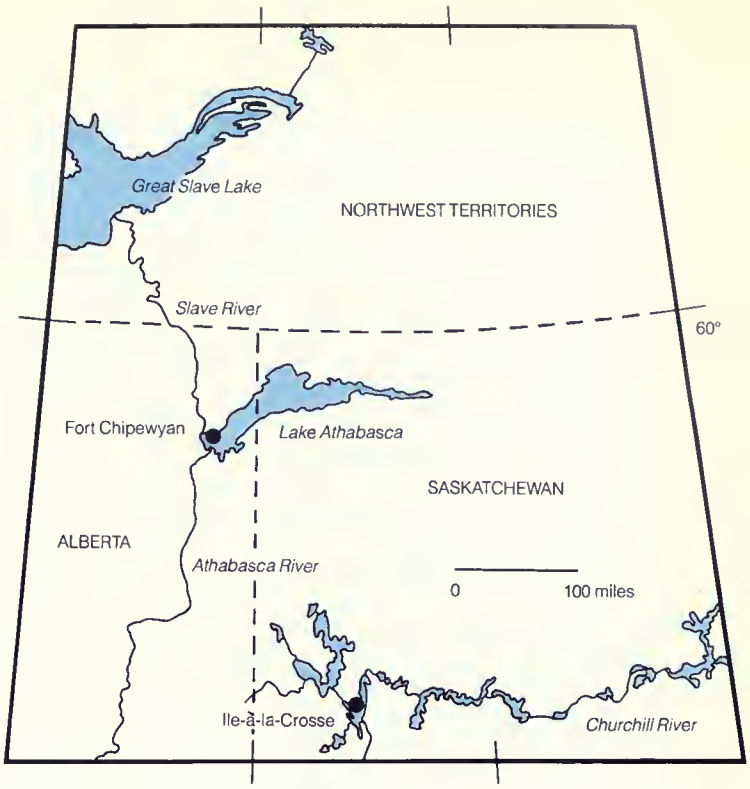
Bags and pouches were of considerable importance to people like the Cree, who traditionally did not provide their garments with pockets, and a number of different forms were adapted to suit a variety of purposes. The pouches described here contained lead shot for muzzle-loading weapons. Early paintings and drawings indicate that these pouches were worn around the neck and hung down across the chest.

When the collector of an ethnographic object is well known, the possibility of determining where the object was collected is considerably enhanced, since the residence or movements of the collector are often documented in published or unpublished historical documents. In the case of the Peabody Museum pouch, with its presumed early nineteenth-century date, we can assume that the collector, Roderick McKenzie, was probably associated with one of the fur trading companies operating throughout western and northern Canada at that time. Unfortunately for our purposes, there were no less than five men named Roderick McKenzie associated with the Hudson's Bay Company and its competitors during the first half of the nineteenth century, a fact attributable to the tendency at that time for young men from Scotland to migrate to Canada and enter the service of trading companies.

The best known Roderick McKenzie seems likely, on the basis of location and time of service, to have been the collector of the cloth pouch in the Peabody Museum. Born in Scotland about 1761, he was a first cousin of the famous explorer Sir Alexander MacKenzie

and came to Canada in 1784. The following year he entered the service of Gregory, McLeod and Company, a firm in which his cousin was a partner. This company, which had previously traded at Detroit and Michilimackinac (on Mackinac Island) in northern Michigan, entered the trade along the Saskatchewan, Churchill, and Athabasca rivers (fig. 1) and in 1785 sent out its first fur trading brigades to the northwest. Roderick McKenzie spent the winter of 1785-86 in charge of the company's depot at Grand Portage on the north shore of Lake Superior, then joined his cousin Alexander at Ile-à-la-Crosse in west-central Saskatchewan. In 1786-87 he wintered at an outpost he built at Lac des Serpents below Ile-à-la-Crosse Lake.

In 1787 Gregory, McLeod and Company joined with the old North West Company to form a new firm with the latter's name. The following year Roderick was sent to build a post on the south shore of Lake Athabasca which he named Fort Chipewyan and it was from there in June, 1789 that his cousin Alexander set off to explore the great river flowing into the Arctic Ocean that today bears his name. The length of Roderick's stay at Fort Chipewyan cannot be determined with certainty, but he was there in 1792 when Alexander began his second major exploring expedition, this time to the Pacific Ocean. The prospects of trade led Roderick McKenzie to construct a winter post on a small island at the entrance to the Mackenzie River in 1790 and he was also stationed at Great Slave Lake in the spring of 1792 in the hope of establishing trade relations with the Athapaskan-speaking Slavey Indians living west of the lake.



1. Map of northern Saskatchewan with a portion of northern Alberta and the southern Northwest Territories.

In 1800 Alexander MacKenzie left the North West Company to join the newly established XY Company, but his cousin did not follow him. Instead he was named a partner of McTavish, Frobisher and Company and was one of the agents of that firm at Grand Portage in 1800. Roderick McKenzie retired from active participation in the trade in 1801 and lived in Quebec until his death in 1844.

McKenzie was a man of considerable literary interests and is said to have established a fine library at Fort Chipewyan. After his retirement from the fur trade, he devoted himself to gathering information for a history of Indian tribes of the Northwest as well as a history of the North West Company. In order to obtain the necessary materials for these works he sent out printed circulars to many of the wintering partners and clerks of the North West Company requesting them to send him letters, journals, and other information relating to company activities and to the life of the native peoples near the posts where they were stationed. Some of this information was later published by McKenzie's son-in-law, L.R. Masson.[1]

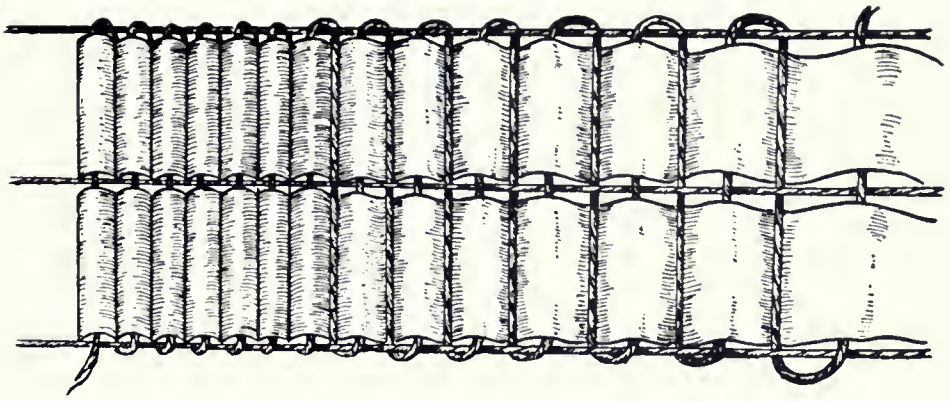
In addition to his documented interest in the cultures of native peoples, it is certain that Roderick McKenzie, during his active years in the fur trade, was also interested in collecting objects of native manufacture. In a letter dated March 2, 1791 Alexander MacKenzie at Fort Chipewyan wrote to his cousin who was then on Great Slave Lake: "I find by your journal, that you have purchased some curiosities; I wish you will miss nothing in that way, as you know, I am destitute of those articles. It would be unbecoming a North-Wester to appear below so impoverished in that line."[2] Although nothing is known concerning the "curiosities" McKenzie was able to collect, either at Great Slave Lake or while stationed at other posts further south, it is possible that the shot pouch now in the Peabody museum was part of his collection.

The Peabody Museum pouch (cat. no. 49319),

1. L.R. Masson, "Les Bourgeois de la compagnie du Nord-Ouest récits de voyages, lettres et rapports inédits relatives au Nord-Ouest Canadien." 2 vols. New York: Antiquarian Press Ltd., 1960 (originally published in 1895).

2. Masson, 1960, vol. 1, p. 36.

2. Shot pouch (49319). Peabody Museum, Harvard University Hillel Burger N31159



3. The woven quillwork technique without sewing (from: W.C. Orchard, "The Technique of Porcupine Quill Decoration among the Indians of North America." Museum of the American Indian, Heye Foundation, 1971).

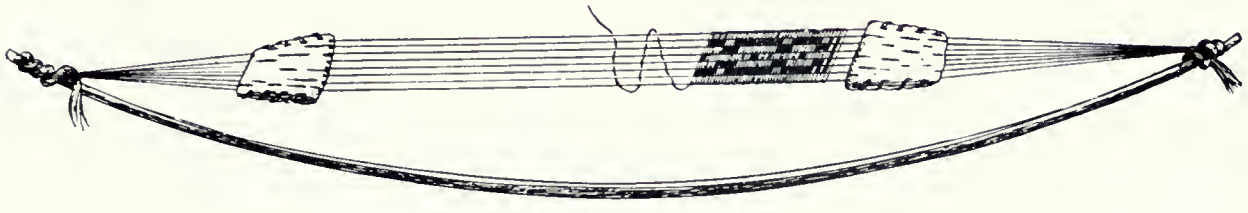
measuring 29 x 16 cm, is constructed from a single rectangular piece of English red wool stroud folded over so that the back extends above the front (fig. 2). The sides are sewn with coarse thread to form a single deep pouch edged on three sides with brown cotton cloth. At the upper end is a piece of appliquéd white silk, the lower edge of which is cut into irregular V-shaped designs.

The major decoration on the front of this pouch consists of a pair of rectangular panels of woven porcupine quills mounted on separate pieces of light-colored wool stroud. Both the warp and weft elements appear to be of coarse thread. The woven technique, in which no sewing is involved except when the weave is finished, was confined to northern Athapaskan tribes, the Cree, Indians of the Great Lakes region, and the Iroquois.

The process of weaving consists of first stretching the warp strands on a wooden bow loom in the same manner as a bow string would be strung. As a spreader for the warp strands, two pieces of birch bark are placed at each extremity of the warp elements. These bark pieces are perforated with a straight row of small holes through which the warp strands run. The distance between these perforations corresponds to the width of a flattened porcupine quill.

A weft strand is attached to the outside warp strand and then passed alternately over and under the warp, by means of a small wooden shuttle, to the opposite side where it is turned and crossed over again. At the same time, the porcupine quills, inserted with the fingers, are woven between the warp strands and over and under the weft elements. As the end of a quill is reached, the final portion protrudes at the back. Then another flattened quill is inserted and the weaving is continued (fig. 3). Moistened quills are used because they are more pliable. On the loom illustrated here (fig. 4), the piece of bark at the left can be moved up and down the warp strands, indicating that it served as a weave sword or beater to tighten the quills and insure a straight line across the weave.

On the Peabody Museum pouch a row of white beads entirely surrounds each quillwork panel and at the ends are rows of green beads inside the white beads. These rows of beads are strung separately from the warp and weft elements. The two decorative quillwork panels are identical. Since the dyed quills are badly faded the colors cannot be determined with certainty, but the motifs appear to be geometric with diamond shapes predominating.



4. A bow loom (from: Orchard, 1971).

5. Shot pouch in Field Museum's collections. Ron Testa

Below each quillwork panel is a fringe of quill-wrapped cloth strips. The quill wrapping includes bands of blue, white, and brown-dyed quills. At the lower end of each fringe strand is a metal dangler from the lower end of which extends raveled, red-dyed trade cloth as a substitute for caribou or deer hair. To hold the fringe in place, each strand is sewn to the front of the pouch just above the dangler.

Between the two decorative panels and fringes is a wide band of blue silk cloth sewn to the wool stroud. It covers the entire width of the pouch.

The shot pouch in Field Museum's collection (cat. no. 197) measures 24 x 16.5 cm. It resembles the Peabody Museum pouch in almost all respects but consists of two rectangular pieces of black wool stroud sewn together with coarse thread along three sides rather than of a single folded piece (fig. 5). The back piece extends above the front and the inside is lined with white cotton cloth. All seams are edged with green cotton cloth and there is a carrying strap of the same material.

Decoration on the front of this pouch also consists of a pair of rectangular panels of woven, dyed porcupine quills with warp and weft elements of coarse thread. These panels are not mounted on pieces of stroud, as are those on the Peabody pouch, but simply sewn to the pouch at either end with the ends of the warp threads. Across the top they are sewn through the selvage edges, but the bottom edges are not sewn to the pouch. On the three sewn sides the panels are edged with unflattened quills wrapped with flattened quills.

The decorative motifs are geometric and may duplicate almost precisely those on the Peabody Museum pouch. Figures 5 and 6 show details of the weaving and the variety of colors used. Most are bright and clear although the yellow is somewhat faded. Extending below each panel is a narrow piece of white wool stroud cut in narrow strips to form a fringe over which dentalium seashells (tooth shells) have been fitted. Tufts of red-dyed caribou or deer hair extend from the end of each shell. The lower ends of the shells are held together by strands of thread which extend across the entire fringe.

Although both pouches appear to be of considerable age, the Indians who made them already had access to a variety of European trade materials. The wool stroud from which both pouches are made, replacing tanned animal hide, was widely distributed by traders across North America at an early date. Glass trade beads began to replace porcupine quills as the major element in decoration early in the nineteenth century and their introduction eventually resulted in a shift from geometric motifs to predominately floral patterns. Beads permitted greater flexibility of design and were much easier

6. Detail of Field Museum's shot pouch showing woven quillwork decoration. Ron Testa

to use than porcupine quills. The use of thread for sewing and weaving rather than sinew and the presence of metal danglers on the Peabody Museum pouch are further indications of European influence. The dentalium shells on the Field Museum pouch were obtained in aboriginal times from the northwest coast by direct or indirect trade. After European contact they were imported by the Hudson's Bay Company and other traders.

With reference to a possible provenience for both pouches, it seems likely, based primarily on documentation for the Peabody Museum specimen and the known travels of Roderick McKenzie, that they were made by Cree Indians. In the late eighteenth and early nineteenth centuries, the Western Woods Cree occupied the full boreal forest west of Hudson and James bays, including the northern portions of Ontario, Manitoba, Saskatchewan, and Alberta. The Peabody Museum specimen was probably collected in the extreme western section of this area, possibly while Roderick McKenzie was on Ile-à-la-Crosse Lake, at Fort Chipewyan on Lake Athabasca, or on Great Slave Lake. In fact, he may have collected the pouch in response to his cousin's request for objects of native manufacture. All this is highly conjectural, of course, but a Cree origin for both pouches is strongly indicated. The Peabody Museum pouch would appear to date from the end of the nineteenth century, while Field Museum's specimen may date somewhat later. Both are fine examples of North American Indian craftsmanship. **FM**

Japanese Lacquer Wares

Inro and Netsuke
From the Carl and Jeanette Kroch Collection

By Lisa Adler, Bennet Bronson, Irene Chong, and Sally Kurth
Photos by Sophia Anastasiou-Wasik and Ron Testa

The Museum is fortunate to have received last year a collection of some sixty Japanese inro with attached ojime and netsuke, donated by Carl and Jeanette Kroch of Chicago. The collection is a fine one. When combined with pieces given in the past by other donors, especially the late John Woodward Leslie of Evanston, the Krochs' gift gives the Museum real strength in the areas of Japanese netsuke, inro, and lacquer work in general.

The illustrations for this article are of inro and netsuke from the Kroch collection. Most of the pieces donated by the Krochs, including all of those shown here, will be on exhibit for the first time this fall. Many will later be transferred to the cases of the regular Japanese and Chinese lacquer exhibit in Hall 32.

Bennet Bronson is associate curator of Asian archaeology and ethnology; Lisa Adler, Irene Chong, and Sally Kurth are volunteers in the Department of Anthropology. Sophia Anastasiou-Wasik is a staff photographer and Ron Testa is head of the Division of Photography.

That exhibit and a previous article in the *Bulletin* (May 1979) give a general introduction to Asian lacquer wares. For readers who have not seen the exhibit or read the article, a short review of the subject may be useful.

First of all, what are inro and netsuke? An inro is a type of small Japanese container, divided into several horizontal sections but otherwise rather like an old-fashioned tobacco can: rectangular in side view and oval as seen from above. It is designed to be

Birds in Togidashi Technique. These are fine examples of togidashi maki-e, one of the most difficult of lacquer decorating techniques. The design, flush with the surface rather than raised in relief as in takamaki-e and hiramaki-e work, is achieved by first building up a design by sprinkling metal powders over layers of lacquer, then covering the design and background with a thick coating of opaque lacquer, and finally polishing the entire surface down until the design emerges through the covering layer. Both are signed with the name of Shiomi Masanari (also known as Masanobu), a well known lacquer artist of the late seventeenth and early eighteenth centuries. It is possible that both were actually made by him, though his signature was often used by later artists.

Left: A flying snow heron over a scattering of reeds. Height 9.0 cm. (284422). *Right*: A wagtail perched in a kingfisher-like pose on a stump overlooking a body of water. Height 6.3 cm. (284371).

Enjoying Nature. Both inro, in high relief or takamaki-e technique, show people enjoying the pleasures of nature: in one, two noblemen and a servant view maple trees in autumn; in the other, a group of men and women admire cherry blossoms in spring. Although the Japanese have long appreciated the charms of being alone in the midst of natural beauty, communing with nature is not always a solitary activity. Cherry blossoms in particular are meant to be viewed in company.

Left: Unusually large gourd-shaped inro. The faces and heads are emphasized with inlaid ivory, mother of pearl, and tortoise shell. Signed Heian Bunshū, or Bunshū of Kyoto. Height 10.3 cm. (284308). *Right*: Signed Kajikawa Bunryusai. The first artist of that name was the third Kajikawa (late 17th c), but the signature was used by at least one later artist (early 19th c). Height 8.2 cm. (284347).

Inro Attached to Ojime and Netsuke. When inro were still in use, they were invariably attached by a silk cord to a bead-like ojime and a netsuke. A modern collector often strives to assemble matching ensembles of these three items. The inro, ojime, and netsuke may be matched by feeling, by theme, by material, color, and/or texture, by artists, or by any combination of these.

The ensemble on the left is entirely of lacquer. The inro depicts a lady in Heian period costume and is signed Koma Koryu (late 18th-early 19th c). The ojime represents a toy ball. The netsuke is in the form of an *inu-bariko*, a papier-mâché dog figure given to infants to bring them luck and protect them from evil influences. The signature on it is that of one Takamasu (ca. 1800). (284344, 284345, 284346)

The ensemble in the center has an autumnal theme. The inro is decorated in low relief on a smooth black ground, showing a lespedeza ("bush clover") plant with several insects above a stream. It is signed Koma Kyuhaku, a name used by several lacquer artists of the 18th century. The unsigned ojime is of gold, with insects and autumn plants. The ivory netsuke is signed Ryōko (20th c) and represents a toad on a sandal made of straw. (284440, 284396, 284442)

The ensemble on the right is composed of pieces that simply look well together. The inro shows the celebrated poet-saint Hitomaro at the bay of Akashi, in a medallion set into a gold flake ground. His face is in ivory inlay. It is signed Yōyusai (1772-1845). The ojime is a simple coral bead. The unsigned "bun-shaped" netsuke is of ivory; the figure is a *tennin*, one of the celestial beings who inhabit the Buddhist paradise. (284380, 284381, 284379)

carried while suspended from a cord. The cord is tied in an elaborate bowknot at the bottom. At the top, the inro is held closed by a bead, or ojime, that slides along the cord. The cord is terminated by a toggle, or netsuke. In the days when inro were used as costume accessories, they were hung from a sash or belt around the waist; the cord was passed under the belt and kept from slipping out by the netsuke.

Netsuke are small three-dimensional objects made to go on the end of a cord, acting both as a counterweight and as a stop to prevent the cord from slipping. A number of East Asian peoples have traditionally used netsuke-like objects on the cords and straps of their belt pouches, knife and chopstick cases, and tobacco containers. The Manchurian, Mongol, and northern Chinese versions of such objects are known in English by the rather confusing term, toggle. The term netsuke, although it shows signs of be-

coming adopted as an English word, is not yet in general use for toggles and counterweights that are not Japanese.

Inro are said to have originally served as containers for medicines. However, they lost this function at about the time they began to be widely used in Japan, during the seventeenth century. Their new function was one that anthropologists consider more basic and interesting than mere health: that is, personal adornment. Like other East Asians, Japanese men did not traditionally wear jewelry. In earlier times the need for status display had been filled partly by clothing and partly by ornaments on personal weapons as well as by the weapons themselves. By the seventeenth century, however, new levels of middle-class prosperity, along with strictly enforced laws concerning who was allowed to carry weapons, gave rise to an intense demand for new kinds of wearable status goods. Japanese artisans met this demand by creating ornaments not from gems and precious metals but from inexpensive raw materials, exquisitely crafted. Most inro were made from lacquer. Netsuke were generally made from lacquer, ivory, or wood.

The word "lacquer" can cause confusion. Oriental lacquer must be distinguished from (1) shellac, made from a resin-like substance deposited by the lac insect; (2) varnish, made from various tree resins dissolved in turpentine; and (3) American lacquer, which is just a glossy type of paint. Genuine Oriental lacquer is a quite different product: a natural polymer —essentially, a plastic—derived from the sap of one among several species of Asian tree, including *Rhus*

The Legend of the Tongue-Cut Sparrow. Once there was an elderly couple who had a pet sparrow. One day the sparrow ate some of the old woman's laundry starch. In a fury, she cut its tongue and drove it off into the woods. The old man, who loved the bird dearly, went searching for it. At last he found it. He and the sparrow greeted each other joyfully, and the sparrow entertained him in its splendid home. As he was leaving, the sparrow offered a choice of baskets as a parting gift, one large and the other small. The old man chose the smaller one. On arriving home he found it was filled with silver and gold. The old woman scolded him and went to visit the sparrow herself. She too was offered a choice of baskets. She took the larger one and carried it off greedily. But when she opened it, a horde of goblins sprang out and began to torment her. The old man lived happily ever after.

Both are in low relief hiramaki-e. The scenes on them are very similar, showing that lacquer artists did not hesitate to use a good idea more than once. They are signed Koma Kansai, a name used by three generations of lacquer artists (late 18th-mid 19th c). *Left*: Height 7.0 cm. (284431). *Right*: Height 6.0 cm. (284401).

vernicifera and *R. succedanea,* which are close relatives of poison ivy and poison sumac, and *Melanorrhoea laccifera* and *M. usutata.* The latter are the sources of the lacquer used in Burma, Thailand, and Vietnam. *Rhus vernicifera,* the *gishu* or *ch' i-shu* of the Chinese and the *urushi* of the Japanese, is considered by most experts to be the "true" lacquer tree.

Urushi tree sap has three unusual properties. First, like the sap of related plants here in North America, it induces very strong allergic reactions in most people. Second, it "dries" best under moist conditions, forming a solid polymer when exposed to humid air and to warmth but not to high heat. Third, solidified lacquer is fairly tough, reasonably strong, and extremely resistant to chemical damage. Although it can be injured by burning and even by long exposure to a dry atmosphere and ultraviolet light, it is unaffected by water and most other chemical solvents. It is therefore often found even in very early archaeological sites. For all its seeming delicacy, lacquer is an eminently practical material: probably the finest industrial polymer known before the twentieth century.

Incidentally, we do not know whether lacquer can be made from the American species of *Rhus.* Poison ivy, oak, and sumac, however, exude large quantities of thick grayish sap when cut, and this hardens into a resinous mass over time. Considering that lacquer comes from several separate Asian species, it seems possible that the sap of at least one

Two Inro of the Shibayama School. Both are signed Shibayama, the name of a family of lacquer workers (late 18th-19th c) and of a technique popularized by them, involving incrustation with various materials in mosaic-like patterns. Shibayama work is currently held in low regard by many collectors. Its ornate character has even led some to claim that such work was made exclusively for export, apparently because they believe that traditional Japanese taste eschewed everything that was so gaudily ornamented. In reality, taste in Japan—as elsewhere in the world—was variable. Many Shibayama pieces were made for and used by Japanese.

Left: A dancer dressed as a *Tengu,* a mythical forest-dwelling creature with a long nose. The foreground shows a toy cart loaded with a fish. Of ivory inlaid and overlaid with shell and coral. Height 8.6 cm. (284353). *Right:* A richly caparisoned elephant of ivory, metal, and shell on a dull gold lacquer ground. It is signed with two names, Shibayama and Kajikawa. Height 8.6 cm. (284359).

Celebrated Places. These two inro show scenic spots long frequented by tourists: Mount Fuji and the countryside around Kyoto. Mount Fuji, of course, is famed for its beauty as well as its sacred character. The Kyoto area contains many noted attractions, a number of which appear on the inro on the right. The small rectangles with written *Kanji* characters give place names, suggesting that the inro could have served as a guide for travelers and pilgrims. Both are made by the high relief or takamaki-e technique. .

Left: A railing, swallows and willows are in the foreground. Signed Koma Koryū (end of 18th-early 19th c). Height 8.3 cm. (284437). *Right*: Signed Shosensai (19th c). Height 9.0 cm. (284368).

American species, if filtered and kept away from sunlight and air before use, would behave like lacquer as well. Readers who are immune to the poison and have backyards full of *Rhus* might find the experiment worth trying.

Lacquer was originally used as a relatively thin waterproof coating over wood. It appeared first in China in the Shang period, about 3,500 years ago. By the Han period, 2,000 years ago, Chinese lacquer-making was carried out on an industrial scale and objects were being made mainly of lacquer, by building up thick layers of that substance over thin shells of cloth or wood. Large government lacquer factories existed. Quantities of finished lacquer wares were shipped to customers as far away as Korea. By the middle Tang period, about A.D. 650-850, Chinese lacquer wares had reached very high levels of technical proficiency and were widely exported. The Japanese were among China's best customers for lacquer. They are said to have imported entire lacquered wood buildings during Tang times.

A significant change began to occur at some point between A.D. 900 and 1000, however. Japanese imports from China declined and Japanese production of lacquer improved very rapidly in quality while moving away from simple imitation of the Chinese product. By 1100 or even before then, the distinctive built-up *maki-e* techniques had been developed and Japan was already making some of the finest lacquer ware in the world.

Over the first few centuries of the second millennium A.D., the Japanese continued to be deeply interested in lacquer—perhaps more interested than most of their neighbors. Japan had no monopoly on creativity. A number of new techniques for working lacquer were invented by Chinese craftsmen during this period and subsequently borrowed by the Japanese; yet the latter continued to show extraordinary skill,

Pictures of Folk Art. This kind of conceptual play, with designs composed of pictures that represent pictures rather than things, was already long established in Japanese decorative arts by the time Zeshin designed these two inro. The woman is Otafuku, a plump person of legend whose picture is carried on bamboo rakes during the folk festival of Tori no Machi. She symbolizes good luck. Both inro bear the signature of Shibata Zeshin (1807-91). One of the greatest of recent lacquer artists, he was noted for complex textures and highly original design effects.

Left: The insets show Otafuku, dice, money and white beans, symbolizing good wishes for the New Year. The background simulates either leather or blackened cast iron. Height 8.0 cm. (284434). *Right*: Two insets of folklore subjects may be seen, a fan-shaped Otafuku picture and an *ema*, a plaque with a painted horse used as an offering at shrines. Height 7.0 cm. (284314).

The Legend of Takasago. These three inro depict different scenes from the same story, that of a couple who have come to represent longevity and wedded bliss. Jo, the husband, and Uba, the wife, lived by gathering pine needles. They died at a great age, in the same hour of the same day. Their spirits then came to inhabit a pair of intertwined pine trees. Until 1931 these pines could still be seen near the shore at Takasago on the Inland Sea.

Left: Jo with his rake. Unsigned. Gold and black lacquer with inlaid gold and silver metal. 8.5 cm. (284287). *Center*: A broom and rake under a pine tree. Signed Zeshin (1807-91). Gold lacquer with inlaid silver metal and shell. Height 8.5 cm. (284329). *Right*: Two pines with their branches intertwined. Signed Jōkasai (late 18th-early 19th c). Black, gold and silver lacquer with inlaid abalone or pearl shell. Height 6.0 cm. (284410).

Seasonal Flowers by Kajikawa School Artists. Many lacquer artists signed their work with the name Kajikawa. Some were actual members of the family of that name, which started making objects of lacquer in the 17th century and continued through the 19th century. Some were apprentices, sons-in-law, or others who earned the right to use the name, and some were outright forgers who appropriated a signature to which they were not entitled either by custom or by skill. Jōkasai was the leading apprentice of the original Kajikawa. He too had many successors who used his name. Each of these depicts a more or less naturalistic floral scene. The chrysanthemums symbolize autumn and the peonies, spring. The flowers with butterflies connote summer. All three inro are in the medium- or high-relief technique called *takamaki-e*.

Left: Chrysanthemums and mist. Signed Kajikawa (17th-19th c). height 8.7 cm. (284281). *Center*: Peonies and dogs. Signed Kajikawa. Height 8.5 cm. (284326). *Right*: Flowers and butterflies, the latter with inlay of silver and pearl shell. Signed Jōkasai (late 18th-early 19th c). Height 8.7 cm. (284302).

often surpassing their counterparts from China and elsewhere in the precision with which their work was executed and in the general quality of their product. By the time Europeans first reached eastern Asia in the sixteenth century, there was no question in anyone's mind who made the most desirable lacquer wares. By far the best on the international market of the 1600s were Japanese, as shown by the large quantities of lacquer boxes, cases, chests, cups, desks, stools, tables, tea-trays, writing boxes, and so forth that are recorded as having been carried from Japan to Southeast Asia, India, Europe, and even to China.

Thus, the first inro appeared in the context of a highly developed and long established industry. Most of the principal lacquer-working techniques were

Netsuke of Ivory and Lacquer. Top row, 1. to r.: Lacquer netsuke in the form of an *oni*, a Japanese demon. The technique used is called *negoro*: a layer of red lacquer is applied over black lacquer and plain wood, then partly rubbed off. Unsigned. Height 5.8 cm. (284313). Lacquer netsuke portraying the Rabbit in the Moon. In Japanese and Chinese folklore the moon is inhabited by a rabbit (technically a hare) who formerly sacrificed himself to become food for the Buddha Sakyamuni and was rewarded with everlasting life. Here he is shown leaning on the moon; in his other paw he holds the pestle with which he prepares the Elixir of Immortality. Signed Tatsuke Takamasu (late 18th-early 19th c). Height 3.7 cm. (284445). Lacquer netsuke with a lid depicting a *ho-o* (phoenix) bird in flight. The Japanese-Chinese phoenix is a powerful supernatural creature and a symbol of the feminine aspect of the universe. It is quite different in symbolic meaning from the phoenix of European tradition, which is not specifically female and which stands for self-sacrifice and regeneration. Unsigned. Height 2.4 cm. (284409). Ivory netsuke representing a cat chasing a rat hiding in a paper lantern. The rat actually moves. Signed Ryōko (20th c). Height 3.0 cm. (284307).

Center row: Lacquer netsuke in the form of a square of silk brocade wrapped with cord. Unsigned. Height 3.4 cm. (284316). Lacquer-covered wooden netsuke in the form of a *shishi*, or Buddhist lion. Characterized by fierce expressions and curly mane, shishi figures often serve as guardians at doors and gates. Signed Shugetsu (18th c). Height 3.2 cm. (284391). Ivory netsuke. The figure's costume and hairdo are those of a European, perhaps a Dutchman. Yet he holds a miniature Buddhist deity in one hand and a toad in the other. He may be Jiraiya, a legendary robber chief, but the symbolism involved is unclear. Signed Kuya (1881-1961). Height 3.0 cm. (284289).

Bottom row: Lacquer netsuke representing a child playing with a shishi (lion) mask. With the signature of Taishan (1825-1903), an outstanding pupil of Zeshin known for the refinement of his work. Height 4.5 cm. (284343). Lacquer netsuke in bun shape. The cutout forms are tea ceremony utensils. Unsigned. Height 1.8 cm. (284400). Lacquer netsuke in the shape of a boat with a painting of a crane on its roof. Signed Yōyusai (1772-1845). Length 6.0 cm. (284430). Ivory netsuke. A tree branch with two loquat fruit. Unsigned. Height 4.2 cm. (284304).

already in existence by the mid-seventeenth century. Japanese ideas of design in the decorative arts, with their distinctive emphasis on contrast, asymmetry, and visual surprise, were well worked out by then. A strong demand existed due to the increasing wealth and size of the middle classes. So it is no surprise that inro proliferated. Their function as status symbols in a very fashion-conscious society meant that quality of workmanship was of great importance and that extreme efforts were made to achieve novel effects in surface treatment and design.

This emphasis on richness and novelty has not always been easy for foreign commentators to appreciate. Perhaps under the impression that the essence of all Japanese art is chaste simplicity, writers on the subject have complained that in the Edo period (1615-1868), "lacquer ware lost its simple artistic effect and degenerated into detailed overornate pictorial designs as a result of the lavish demands of the rich merchant class." The present authors do not doubt that this is partly true. And yet we confess that the gulf that supposedly separates the early simple lacquer made for the aristocracy from the late ornate lacquer made for the bourgeoisie is not always obvious to us. Many lacquer objects of the Edo period, including many inro, are not at all showy or vulgar. Whether or not the people who used them were mere merchants, such objects rank with the more brilliantly simple of all known examples of decorative design. **FM**

FIELD MUSEUM TOURS

Voyage to Patagonia and Cape Horn

Including the Falklands and the Majestic Fjords of the Southern Andes

Aboard the *Illiria*
March 9 - 19, 1988
Accompanied by Dr. James S. Ashe, Field Museum Zoologist

ITINERARY

Day 1: March 9
USA/Santiago
Depart USA on a regularly scheduled flight to Santiago.

Day 2: March 10
Santiago
Morning arrival in Santiago with transfer to Hotel San Cristobal Sheraton. Balance of the day at leisure. This evening attend a welcome cocktail reception and dinner at a local restaurant.

Day 3: March 11
Santiago
In the morning tour cosmopolitan Santiago, situated at an impressive location below peaks that rise to 18,000 feet. Founded in 1541, Santiago is the nation's modern, bustling capital. Visit the museum of natural history, with its collection of Indian folk art; Santa Lucia Hill, where Santiago was founded; colonial San Francisco Church with its art treasures; and San Cristobal Hill, which affords panoramic views of the city and the Andes Mountains. Afternoon at leisure.

Day 4: March 12
Santiago/Punta Arenas/Embarkation on *"Illiria"*
Morning flight to Punta Arenas, the Patagonian city on the northern shore of the Strait of Magellan. Board the *Illiria* and sail in the afternoon. Cruise westward on the waterway separating the Atlantic from the Pacific Ocean, and continue along the Patagonian coast.

Located between the Andes and the Pacific Ocean, the Pacific coast of Patagonia is one of the most spectacular areas in the world. The countless islands, which create a maze of channels and passages, combined with the grandeur of the ice-capped southern Andes which drop precipitously to the sea, make a ship journey here an unforgettable travel experience.

Day 5: March 13
Bay of Mountains/ Strait of Magellan/Beagle Channel
From Puerto Natales, the *Illiria* will proceed to the Bay of Mountains, a steep fjord, and continue to the Strait of Magellan. This famed waterway, which winds for about 360 miles in widths ranging from 2 to 20 miles, separates the land mass of South America from Tierra del Fuego, an archipelago of the continent's southern tip. Enter the Beagle Channel. Here, the impressive mountains of the Cordillera Darwin rise sharply from the sea to create one of the world's most breathtaking fjords. Explore some of the area's spectacular glaciers by zodiac (rubber boats) including Garibaldi Glacier. If conditions permit, land on brilliant white Alemania Glacier.

Day 6: March 14
Ushuaia/ Tierra del Fuego National Park
Ushuaia, Argentina's center in Tierra del Fuego and the most southerly town in the world, has steep streets leading to the mountains, against which the town is built. Many vantage points in the town offer fine views of the nearby snow-covered peaks, rivers, woods, and waterfalls.

An excursion travels to the Tierra del Fuego National Park, comprised of 154,000 acres of mountains and lakes. The park is home to many species of birds and over 500 types of flowering plants. Enjoy a picnic lunch amidst this breathtaking scenery.

Day 7: March 15
Cape Horn
Early in the morning, reach Cape Horn and, weather permitting, make a landing on this landmark, first rounded in 1616 by the Dutch navigator Willem Cornelius Schouten. Born in Hoorn, Netherlands, Schouten appropriately named the cape after his hometown. Cape Horn, a steep rocky headland on Horn Island, marks the southernmost extremity of South America. Depart Cape Horn and continue cruising toward the Falkland Islands.

Day 8 and Day 9: March 16 and 17
Port Stanley/Carcass Island/ West Point Island, Falkland Islands
In the early afternoon of Day 8, arrive in Port Stanley, the main town of the Falklands. First visited in 1592 by the English navigator Captain John Davis, the Falklands changed hands several times between England, France, and Spain. Since 1832 they have been administered by England (despite Argentina's claim which culminated in 1982), and thus most of the approximately 2,000 inhabitants are exclusively of British descent. In their early history, the islands were stopping-off places for whalers and sealers bound for Antarctica. While in Port Stanley, see the impressive hulks of clipper ships which took refuge in the Falklands. For years, scientists have been attracted to the islands' rich wildlife, which is indeed among the most spectacular in the world. This is due to both the lack of human intrusion and the islands' diverse landscape, which ranges from inland moors, lakes, and mountains, to dramatic coastlines, characterized by abrupt cliffs and rocky beaches. Penguins alone include rockhoppers, magellenic, and king. The tameness of the birds of the Falklands is remarkable and there are over 50 species. Large colonies of sea lions and fur seals are found on the beaches. During our stay in the Falklands, visit the rich wildlife sanctuaries on Carcass and West Point Islands.

Day 10: March 18
At Sea
Spend the day at sea cruising toward the South American continent.

Day 11: March 19
Punta Arenas/USA
Early in the morning, the *Illiria* will enter the Eastern entrance of the Strait of Magellan and wind its way to Punta Arenas. Disembark for a tour of Punta Arenas which includes the Patagonia Institute and the Silesian Museum, with exhibits relating to the region's Indians and animal and bird life. Continue to the airport for the flight to Santiago. Enjoy dinner in Santiago before flying to the USA with arrival early the next morning.

Rates: $2,795 - $4,295 per person (double occupancy) Single cabins are available.
These rates do not include air fare
These rates do include a $200.00 contribution to Field Museum of Natural History.

Optional Extensions:
Pre-Cruise: Rio De Janeiro and Iguassu Falls
Post-Cruise: Easter Island

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

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"Cultural Energy"

Photos of North and South American Cultures by John Collier Jr.
Through November 1, in Hall 9

"Cultural energy describes the flow essential to the survival of all human organization," says John Collier Jr., whose photographic exhibit "Cultural Energy" opened in Hall 9 on September 19. Approximately 145 black-and-white photos depict the vitality of six distinct North and South American cultures. Through this moving, slice-of-life photography, Collier helps preserve the cultural identity of ethnic groups struggling to maintain their personality in a homogenized modern world.

"Cultural Energy" documents the life flow of such people as the Navajo Dineh, a tribal nation which speaks an Athabaskan language and lives in the desert and mountain land. Spanish Americans are also included in the exhibit. Collier studies a group of New Mexicans whose presence in that region dates back 400 years. Today they are caught midway between their Spanish past and their present Anglo-dominated environment.

Other cultures include Portuguese fishermen of Provincetown Massachusetts, French-speaking Acadians from the backwoods of Maine, Indians of the Andes and Venezuelan farmers. "My photographic assignments, from the Eskimos of Alaska to the Indians of the Peruvian Andes, have shown me that it is the cultural base that preserves personality," says Collier. It is this "personality" that emanates so vividly from Collier's photos. The exhibit is free with regular Museum admission.

"Sizes"

New Permanent Exhibit Opens October 10

In the world of the living, things are the size they are for natural reasons. Although fictional characters such as Godzilla and Thumbellina can be exciting, their exaggerated sizes could never be achieved in the real world.

Field Museum's new exhibit "Sizes" explores issues and concepts of size and scale in the natural world. An interactive exhibit, "Sizes" is designed to stimulate visitors with thoughts about their own size in relation to the rest of the world. The exhibit is designed for informal use, with no necessary sequence to follow. Children and adults will enjoy exploring their way through 15 units, studying one aspect of the natural world and having some fun in the process.

Among the displays is an oversized table which is set with oversized dishes and eating utensils. Visitors are welcome to sit at the table and experience everyday objects proportioned to a different scale than what they are used to. A specially constructed room with angled floors, walls, and ceiling demonstrates how size perceptions can be affected by tricking the senses. From some areas of the room children will seem adult-size, while across the way their parents might appear very small.

Other exhibit units explore the metabolism and body mechanics of different sized animals. Visitors are made conscious of their own size by trying on different articles of clothing including Chicago Bears' William Perry's shoulder pads. Exhibit free with regular Museum admission.

Coming in November:

"Tiffany: 150 Years of Gems and Jewelry"

November 7 through February 6

Be sure to see this spectacular exhibition of Tiffany & Co. jewels and American gemstones. A special exhibit highlight will be the famed 128 carat Tiffany Diamond, the world's largest and finest canary diamond. Members' Preview, Saturday, November 7, 5:00-10:00 p.m.

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

November 1987

TIFFANY

150 Years of Gems and Jewelry

November 7 through February 6

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EVENTS

Life Among the Dinosaurs

John Horner, Curator of Paleontology,
Museum of the Rockies, Montana State University

Saturday, November 14, 2:00pm

In 1978 an Amateur Paleontologist made a remarkable find in the Rockies of Western Montana: the fossilized remains of 15 hadrosaurs (duck-billed dinosaurs). These fossils have led to one of the most exciting discoveries about dinosaur behavior in recent years.

Near the original discovery site and in one other site in Montana, John Horner and his colleagues have since unearthed more hadrosaur fossils as well as complete fossilized eggs. The presence of baby skeletal remains of the hadrosaurs show that these dinosaurs took care of their young in nests for several months. Horner concludes that what is being found is not just a few random nest sites, but evidence that the hadrosaurs nested in colonies for protection against predators, and perhaps that they even traveled in herds. Never before have paleontologists found such overwhelming evidence of how dinosaurs nested and took care of their young. In another site Horner found nests with what appear to be baby hypsilophodontid dinosaurs, which clearly show that these animals returned there year after year.

John Horner is curator of paleontology at the Museum of the Rockies in Bozeman, Montana and adjunct professor of geology at Montana State University. His discoveries of dinosaur nesting grounds and fossilized baby dinosaur skeletons have stirred considerable interest around the world in the field of paleontology. He has published widely on his findings and been featured on ABC's "20-20." In 1986 he received a MacArthur Foundation fellowship for his studies of dinosaur behavior.

Join John Horner as he shares his recent fieldwork findings and discusses his new theories on the evolution and behavior of dinosaurs.

L87201 Life Among the Dinosaurs

Tickets: $6.00 ($4.00 members).

This program is funded in part by the Ray A. Kroc Environmental Foundation.

Registration by mail

Please use coupon on page 4 to order tickets by mail. Be sure to complete the requested information and make checks payable to Field Museum. Tickets will be mailed upon receipt of check. Refunds are made only if the program is sold out.

By Phone

Register by phone with American Express/Visa/MasterCard/Discover. Call Monday through Friday, 9:00am-4:00pm.
(312) 322-8854.

EVENTS

Dinosaur Days

November 7 and 8, 14 and 15, and 21

The Roar of the "Thunder Lizard" is heard once again. Dinosaurs reigned the earth for 150 million years and then disappeared. Why? Investigate the birth, life, and extinction of these prehistoric creatures. Visit a dinosaur nesting site and a paleontologist's field camp. Find out why continental drift and the temperature of dinosaur blood are "heated" issues. Take a look at dinosaur types and consider why some found horns, frills, plates, and crests to be their style. Discover what it's like to dig in a fossil bone bed or how to prepare a fossil for study.

All Dinosaur Days events are free with Museum admission.

Saturdays, November 7, 14, and 21
1:00-3:00pm

"Picture This!"
Paint yourself a dinosaur-sized picture of Earth's prehistoric past.

Saturday and Sunday, November 7 and 8
1:00-4:00 pm

Extinction Wars
Whatever happened to the dinosaurs? There are many hotly contended theories. Using large picture dioramas, find out some of the leading ideas.

Hot- and Cold-Blooded Dinosaurs
Old assumptions that dinosaurs were reptiles may not be true. New evidence, presented in this demonstration, shows that dinosaurs may have been warm-blooded.

Nests and Footprints—Dinosaur Behavior
Giant trackways (trails of fossilized footprints) and fossilized nests tell us many things about dinosaurs: what good parents they were, who was predator and who was prey, how big they were, and how fast they ran.

The Fossil Process
Through this demonstration and activity, discover the unique processes of fossilization.

Dinosaurian Epicure
Examine the skulls and teeth of herbivores and carnivores, and cast a dinosaur tooth of your own.

Continental Drift
Find out how, for millions of years, continents have moved across the earth's surface.

Life Among the Dinosaurs

Registration

Be sure to complete all requested information on this ticket application. If your request is received less than one week before the program, tickets will be held in your name at the West Entrance box office. Please make checks payable to Field Museum. Tickets will be mailed upon receipt of check. Refunds will be made only if the program is sold out.

☐ Member ☐ Nonmember

American Express/Visa/MasterCard

Card Number

Signature Expiration Date

Name

Address

City State Zip

Telephone: Daytime Evening

Return complete ticket application with a self-addressed stamped envelope to:

Field Museum of Natural History
Public Programs: Department of Education
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Program	#Member Tickets ($4.00 ea.)	#Nonmember Tickets ($6.00 ea.)	Total Tickets	Amount Enclosed
L87201 Life among the Dinosaurs				
			Total	

☐ Scholarship requested

EVENTS

"THE FAR SIDE" cartoon by Gary Larson is
reprinted by permission of Chronicle Features, San Francisco.

Dinosaur Days

Saturday and Sunday, November 14 and 15
11:00-11:30am; 12:00noon-12:30pm

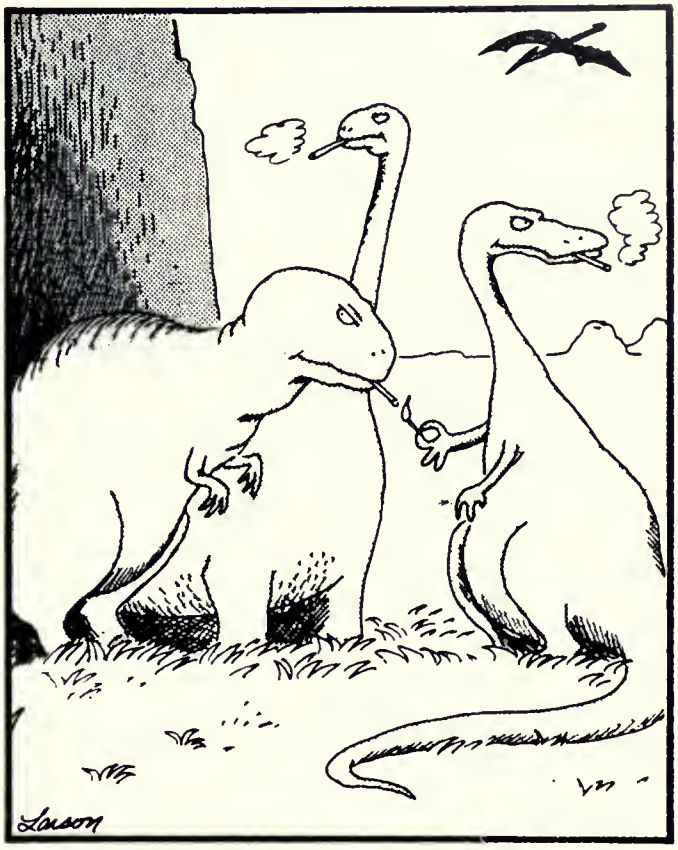
Tales of the Prehistoric
Listen and look at some of everyone's favorite dinosaur stories, including *Maia: A Dinosaur Grows Up*, *Danny and the Dinosaur*, *A Pterodactyl, the Story of a Flying Reptile*, and *Patrick's Dinosaurs*.

1:00-4:00pm
Field Camp: Fossils from Field to Lab
Explore our simulated paleontologists' field camp. Discover at various stations new facts about finding fossils in the field, excavating them, protecting them for the long trip to the lab, and preparing them for scientific study: bone beds and fossil finds; coal ball peels: a close-up look at fossil plants; fossil fish preparation; field jackets: protecting the fossil; lab preparation; trackways.

Saturday, November 21
11:00am, 1:00pm, and 3:00pm
Lifestyles of the Extinct and Fossilized
A satiric revue of the habits, idiosyncracies and appearance of Mesozoic creatures.

1:00-4:00pm
Living Fossils
Discover the prehistoric creatures still alive today.

Coal Ball Peels
A close-up look at fossil plants.



The real reason dinosaurs became extinct

Continued ▷

EVENTS

Adult Courses

"Tiffany: 150 Years of Gems and Jewelry."

This exhibit presents the evolution of jewelry design in the United States, focusing on Tiffany's unparalleled role as designer, manufacturer, and purveyor of fine jewelry. Highlighting the Tiffany exhibit, this featured lecture series introduces the study of gems and explores the significant contribution of Tiffany & Co. to the jewelry field in the past 150 years.

☐ November 17
"The Geology of Gems"
Paul Sipiera, associate professor of Earth Sciences, Harper College.

☐ November 24
"A Gemologist's View"
Tedd W. Payne, graduate gemologist

☐ December 1
"Tiffany"
Wallace Steiner, divisional vice president, Tiffany & Co., Chicago.
AC 87401

Tuesdays, 7:00-9:00pm, November 17-December 1
(3 sessions)
$50 ($40 members)
For further information on this and other adult programs, contact the Department of Education at (312) 322-8855.

Brooch containing 10 Montana sapphires, 11 Mississippi pearls, and 102 brilliant diamonds; 1901. On view in the exhibit "Tiffany: 150 Years of Gems and Jewelry," November 7 through February 6.

November and December Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the Weekend Programs sheet upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

NOVEMBER

7 1:30pm: *Tibet Today and A Faith in Exile* (slide lecture). Investigate Lhasa and refugees in Dharmsala (home of the Dalai Lama), Darjeeling, and Sikkim.

21 1:30pm: *Tibet Today and Bhutan* (slide lecture). See Lhasa and other towns now open to the public, as well as Bhutan, Land of the Thunder Dragon.

DECEMBER

12 1:30pm: *Tibet Today and A Faith in Exile* (slide lecture). Investigate Lhasa and refugees in Dharmsala (home of the Dalai Lama), Darjeeling, and Sikkim.

11 2:00pm: *Malvina Hoffman: Portraits in Bronze* (slide lecture). Examine the life and works of Malvina Hoffman, concentrating on the Portraits of Mankind Collection commissioned by Field Museum.

These programs are free with museum admission, no tickets required.

EVENTS

Wintertime Tales

STORYTELLING has been the path that civilizations throughout the world have used to pass on heritage, custom, religion, and explanations of the unbelievable. Join some of Chicago's best storytellers and hear about the exciting world around us.

December 27, 12:00noon and 2:00pm
Tales of the Caribbean with Keith Eric

December 28, 12:00noon and 2:00pm
Traditional African folk tales with Shanta

December 29, 2:00pm
Traditional African folk tales with Nora Blakely

December 30, 2:00pm
Traditional Thai tales told through dance by the Thai Classical Dancers

These programs are free with Museum admission.

Children Play: Games Around the World

Saturday, December 5, 12, and 19
1:00-3:00pm

DISCOVER THE FUN AND EXCITEMENT children around the world enjoy by playing their games. Take off those winter galoshes and let your feet fly in Philippine tininkling, Chinese jump-rope, Eskimo seal races, and more.

Winter at the Field Hall Interpretive Program

Thursday through Sunday
November and December

DURING NOVEMBER AND DECEMBER, you can compare the size of *Apatosaurus* to *Compsognathus*, discover the differences in right- and left-spiraled shells, learn a string game from the Arctic, play a Native American dice game, and more. Hall Interpreters, dressed in blue aprons and located throughout the exhibit halls, help young and old to experience the wonders of Field Museum.

These exciting activities are available to all Museum visitors Thursdays through Sundays, and everyday during the holiday periods. Please consult the television monitors throughout the Museum for activity locations.

The Hall Interpretive Program is supported by grants from the Lloyd A. Fry Foundation and the Joyce Foundation.

World Music

Weekends in November and December
1:00pm and 3:00pm

MUSIC COMMUNICATES IN MANY WAYS. It is something that can be shared by all of us, whether or not we have common lifestyles, beliefs, or even languages. From the spiritual harp of Light Henry Huff to the lively songs and stories of Shanta, November and December are musical celebrations at Field Museum.

November 7 and 8
1:00pm—Alas Poets
3:00pm—Light Henry Huff, harp

November 14 and 15
1:00pm and 3:00pm—Don Pate, jazz bass

November 21
1:00pm and 3:00pm—Fan Wei-Tsu, zheng, Chinese zither

November 28
1:00pm and 3:00pm—Manu and Nageree, traditional African music

December 5 and 6
1:00pm—Light Henry Huff, harp
3:00pm—Alas Poets

December 12 and 13
1:00pm and 3:00pm—Don Moye, African percussion

December 19
1:00pm and 3:00pm—Thai Classical Dance

December 26
1:00pm and 3:00pm—Light Henry Huff, harp

December 27
1:00pm—Manu and Nageree, traditional African music
3:00pm—Librado Salazar, classical Spanish guitar

December 28
1:00pm—Thunder Sky Drummers, African percussion
2:00pm—Fan Wei-Tsu, Chinese zither
3:00pm—Thunder Sky Drummers, African percussion

December 29
1:00pm—Amira, African Shakere
2:00pm—Amira, African Shakere
3:00pm—Light Henry Huff, harp

December 30
1:00pm—Shanta, storyteller
2:00pm—Light Henry Huff, harp
3:00pm—Shanta, storyteller

The World Music Program is supported by the Kenneth and Harle Montgomery Fund and a City Arts III/IV grant from the Chicago Office of Fine Arts, Department of Cultural Affairs.

Your Member's Invitation to

Tiffany: 150 Years of Gems and Jewelry

You are cordially invited to attend the Member's Preview of Tiffany: 150 Years of Gems and Jewelry at Field Museum on Saturday evening, November 7, 5:00 until 10:00 p.m.

Because of the limited capacity of the hall, a ticketing system to regulate admission to the exhibit will be implemented that evening. Tickets will be given out at the central booth in Stanley Field Hall.

Light refreshments will be available for purchase from Convito Italiano as well as beverages from the cash bar. The "new" museum store will remain open until 9:45 p.m.

Special arrangements for handicapped persons can be made by calling 922-9410, ext. 453. The CTA #146 Marine/Museum bus services Field Museum. Call CTA (836-7000) for schedules.

The Tiffany Diamond, the largest and finest canary diamond in the world: 128.51 carats.

TIFFANY

150 Years of Gems and Jewelry

November 7 through February 6

For more than a century, Tiffany & Co. has dazzled the world with their highly imaginative and exquisitely crafted jewelry. Throughout their history, Tiffany & Co. has delighted us with their uniquely American style in jewelry design; a style inspired by nature, the selection of superior gemstones and a true love of design.

Now, for the first time in their 150-year history, a stunning retrospective of Tiffany & Co. jewels and American gemstones has been created, and Chicago is the first to see it.

The exhibition "Tiffany: 150 Years of Gems and Jewelry" is filled with over 100 breathtaking gems and jewelry objects showing the evolution of jewelry design in America and the unparalleled role Tiffany has played in this history. Most of the jewelry pieces belong to private collectors and have never before been publicly displayed. A special exhibition highlight will be the famed 128-carat Tiffany Diamond, the world's largest and finest canary diamond.

Field Museum is proud to host this once-in-a-lifetime exhibition in celebration of Tiffany & Co.'s 150th Anniversary.

Bracelet, with rubies, sapphires, diamonds, emeralds, and platinum; late 1920s. This magnificent bracelet represents one of the most opulent and masterful jewelry styles of all time. In the late 1920s, Tiffany was supplying their patrons in New York and Paris with jewelry and other objects inspired by the decorative arts of many civilizations: Islamic, Chinese, French, and Egyptian.

THE TIFFANY CONNECTION

The association of the Field Museum with America's oldest jeweler, Tiffany & Co., began back in 1893. Tiffany made a cash contribution to the Museum's original endowment. Also, it was one of the newly appointed Museum trustees, Harlow N. Higinbotham, who purchased the gems and jewels that had been exhibited by Tiffany at the 1893 World's Columbian Exposition, and donated them to the (then) new Museum. This collection became the original gem exhibit. Although many new objects have been added to the collection over the past 94 years, those original pieces are the core of the present beautiful Grainger Hall of Gems.

The special exhibit "Tiffany: 150 Years of Gems and Jewelry" renews the Field Museum's association with this estimable company. A restrospective exhibit, it will display examples of innovative jewelry design and gemstone useage from America's oldest, continuously operated house of opulent jewels.—*Edward J. Olsen, Curator of Mineralogy and Co-Curator, "Tiffany: 150 Years of Gems and Jewelry"*

Iris corsage ornament. Gold, sapphires, diamonds, topaz, and garnets; height 9.5 cm. 1900. On loan from the Walters Art Gallery, Baltimore, Md. This natural size iris corsage ornament was included in Tiffany's exhibit at the Paris Exposition Universelle in 1900. The blossom is set with 139 sapphires from Montana and, for contrast, tiny diamonds line the center of each petal; a yellow topaz terminates each of the three falls. Green demantoid garnets convey the natural color of the leaves.

Five brooches (from top): lapis lazuli, gold, and enamel; brown jade, gold, and enamel; amethyst, gold, and enamel; Montana sapphires, green tourmaline, and gold filigree; Montana sapphires, gold, and enamel.

Small dandelion vase, yellow and green enamel, gold. Early 1900s.

Opal sunburst brooch pendant; opals, diamonds, gold, and platinum. Late 19th century.

Pink flower brooch (above), made of enamel, diamonds, and gold; ca. 1889. Thistle stickpin, made of enamel and gold; ca. 1889.

◁ Donald Claflin disk brooch; ivory, rubies, sapphires, cabochon emerald, turquoise, diamonds, and gold. 1970s.

Ivory inkwell, ivory seal, and ivory card case. These lovely ornamental objects from the late 1800s were designed to bring the grace associated with the Japanese into daily American life. They display a variety of influences, including the trailing plant patterns of Islamic mosaics and carpets, small eroti from rococo sculpture and decorative objects, and the naturalistic forms of European art nouveau.

Dog collar, made of gold, enamel, turquoise, pearls, and diamonds. Early 20th century.

A Special invitation to Museum Members to

A FAMILY CHRISTMAS TEA AT FIELD MUSEUM

Thursday, December 10

The Stuff Of Dreams

Native American Dolls

Left to right: Cuna curing doll from Panama; dressed as European doctor, possibly because European medicine was believed to be especially efficacious; Ojibwa wooden figure used by a Midewiwin practitioner for curing the ill; wooden doll used by Eskimo shaman; Tlingit figure, possibly of shaman himself, carved from antler; Aymara doll representing god of good fortune in the Andean highlands.

Left to right: Bella Bella puppet; Kwakiutl doll with eyes of abalone; Gitksan puppet.

Left: Blackfeet doll with wooden head and cloth body. Right: Chiricahua Apache doll wearing classic two-piece woman's hide dress.

The Stuff of Dreams
Native American Dolls

by Mary Jane Lenz

Exhibit opens November 18

"We are such stuff as dreams are made on."
William Shakespeare, The Tempest

Shakespeare's poetic metaphor for human existence also holds true for those small replicas of human beings we call "dolls." In the wildest sense, all dolls are created in response to dreams: the imagination of children, the visions of shamans and sorcerers, the creative energy of individual artists. The great leap of the imagination which inspired the creation of an image of the self is a human gift alone and part of the human experience everywhere.

To think of a doll as "a child's toy; a puppet," as the dictionary defines the term, is to take a narrow view of these small representations of the human form. Antonia Fraser suggests that "doll" may derive from the Greek *eidolon*, from which the word "idol" has also developed.[1] She points out that in the Chinese and Korean languages the word for "doll" and the word "idol" or "fetish" come from the same root.

In English, the word "doll" was not in common use until about 1450, but dolls themselves existed long before that time and far beyond the boundaries of the English language. The "Venus" figurines of the Upper Paleolithic period; the *ushabti* figures of ancient Egypt left in tombs to serve the dead; the toy dolls of Greek and Roman girls, placed on a goddess' altar on the eve before marriage; the Hina dolls of Japan displayed during the yearly doll festival—these and many other dolls have been part of the human heritage since the beginnings of art, more than 25,000 years ago.

This exhibition of Native American dolls shows that in our hemisphere dolls, in the broad sense of the

Kiowa doll with china head

Mary Jane Lenz is also curator of the exhibit, "The Stuff of Dreams: Native American Dolls."

Reproduced from *The Stuff of Dreams: Native American Dolls*, by Mary Jane Lenz, copyright © 1986 by the Museum of the American Indian, and reprinted here courtesy of the author.

Tanaina shaman's doll, Cook Inlet, Alaska.

Clay dolls: Yuma (left), and Mohave.

word, have taken many forms: toys for children, sacred and magical figurines, props and performers in drama and dance and in recent years, items manufactured for sale. Made of twigs or cloth, ivory or stone, roughly carved with a few knife strokes or made with exquisite care and attention to detail, the dolls share one essential quality—each presents an image of what it means to be human.

For many people, the miniaturization of form represented by a doll makes it an object with a special appeal and presence. This appeal may explain the wide distribution of dolls in time and space throughout the world. Lévi-Strauss argues that miniatures — small-scale models of objects — may represent the universal type of what is commonly referred to as art. He suggests that the reduction in scale helps us not only to see what is the whole but also, in a sense, to master it by making it less formidable and easier to comprehend. " A child's doll," he writes, "is no longer an enemy, a rival, or even an interlocutor. In it and through it a person is made into a subject."[2] In other words dolls provide a way of mastering and comprehending our own humanity. They are also a means of personifying and making manageable the mysterious forces of the unknown—natural catastrophes, sickness, sorrow, and death. If so, dolls as metaphors of mystery and power may speak to deep and hidden needs in the human psyche, and may be indeed "the stuff of dreams."

The exhibition focuses on the ways in which dolls have been created and used by the Native Americans throughout the Western Hemisphere, in the past as well as the present. The dolls from the collections of the Museum of the American Indian show a geographic range from Alaska and Greenland to Chile, and a temporal span of more than 4000 years. The oldest is a prehistoric ceramic figure from Valdivia, Ecuador; the most recent is a Laguna Pueblo Storyteller doll made in New Mexico in 1984. The great variety of materials and form reflects the richness and diversity of Native American cultures, for just as each group has its own artifacts so it also has its own lifeways.

In one sense dolls illustrate how people see themselves and others. The details they choose to emphasize in their dolls — body paint, clothing, hair styles,

Mapuche man on horse (Araucanian Indians of Chile)

accessories, posture or stance—offer us a way of seeing some of the essentials of differing world views.

The variety of materials used to make dolls reflects the wide differences in Native American environments. Eskimo dolls are made from walrus tusk ivory. Iroquois dolls are fashioned from cornhusks. Tapirapé dolls of the Amazon Basin are constructed from beeswax and the brilliantly colored feathers of tropical birds.

Dolls of the Americas are made not only of indigenous materials but of goods introduced by foreigners who began trading and settling 500 years ago. European and Oriental glass beads adorn both play dolls and shaman figures. Silk ribbon, wool flannel, and bright calicos decorate doll clothing as they do people's clothing. Bits of glass became the eyes for a Tree Dweller figure from the eastern Plains. French trading tokens hang from the beaded belt of a wooden doll from Alaska. Indians laced European dolls into toy baby carriers and played with them, or wrapped them in special medicine bundles to invoke love medicine. We can see in the physical composition of these dolls the blending of several cultural traditions and the waves of a world market lapping even at the most isolated shores of the Americas.

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1. Fraser, Antonia, *Dolls.* London: Weidenfeld and Nicolson. 1963. pp. 7ff.
2. Lévi-Strauss, Claude. *The Savage Mind:* The University of Chicago Press. 1966. Originally published as *La Pensée sauvage,* Librairie Plon, Paris, 1962. p. 23.

Quiche man (Guatemala)

THE FAMILY OF RUATEPUPUKE

Reviving a Maori Meetinghouse

by Tory Light

photos by James L. Ballard
except where noted

"ONCE YOU'RE A MAORI, you're always part of the family," exclaim Jane Connolly and Barbara Ballard about their friendships among the native people of New Zealand. Connolly and Ballard participated in Field Museum's tour to New Zealand, April 14 to May 4, 1986. Led by Dr. John Terrell, curator of Oceanic archaeology and ethnology, they and 16 other Museum members embarked on a journey that turned out to be much more than "just a vacation."

Organized by Field Museum Tours Manager Dorothy Roder and guided by Marina Ropiha of Maori International, the trip began as an extension of the exhibit "Te Maori: Maori Art from New Zealand Collections," on view during the spring of 1986. The itinerary sought to cover the Polynesian and British history of New Zealand. But then Dr. Terrell and the tour group defined two specific goals. The first was to reciprocate the visit of more than 75 Maori to Field

Museum staff and New Zealand tour participants before the Museum's Maori meetinghouse as they prepare for a "sleep-in." Seated (l. to r.): John Terrell, Dorothy Roder, Irene Schultz; standing: Tamara Biggs, Frances Osgood, Delbert Yarnell, Cap Sease, John Cook, Donald Cameron, Dorothy Cameron, Bruce Feay, Mary Feay, Bill Roder, Barbara Ballard, Jane Connelly, John McDonald, Dagmara Nyman, Sharon Paré, Glenn Paré, and Jerome Schultz. A110424

John Terrell, curator of Oceanic archaeology and ethnology, and Maori elder Mrs. Iranui ("Auntie Ada") Haig. A110420

Museum, where they had been invited to participate in the opening and closing ceremonies of "Te Maori." The second aim was to investigate the origins of Ruatepupuke II, the Museum's own Maori meetinghouse, possibly the only authentic structure of its kind outside of New Zealand.

Now known to have been carved and erected in the village of Tokomaru Bay, New Zealand, in about 1861, this family-owned house was sold in the 1880s by Mokena Romio, a village leader, without his family's consent; the selling price is not known. Because Maori custom forbids the sale of inherited possessions, Romio's act brought about a major tribal rift that remained unhealed until his brother's granddaughter made a reconciliation at the house at "Te Maori," nearly a century later.

The original buyer of the meetinghouse was a Mr. Hindmarsh, a dealer in Maori curios. (His family today owns the Hindmarsh Motor Coach Company, which takes passengers to New Zealand tour sites.)

In 1902, a German curio dealer, J.F.G. Umlauff, bought the house and installed it in his Hamburg gallery. Three years later, Dr. George A. Dorsey, then curator of Anthropology of Field Museum, purchased it for the sum of 65,600 marks ($5,000 at the 1905 exchange rate).[1] The house has been on view at the Museum since 1924. It is currently a popular feature of the exhibit "Gods, Spirits and People."

In New Zealand the Field Museum tour group learned that the Maori regard their meetinghouse with much more significance than we Westerners regard our own houses, schools, or places of worship. Most Maori communities in New Zealand have built such houses, which for more than a century have functioned as a combination council hall/dormitory and sometimes church.

It is especially meaningful that such carved houses represent specific ancestors, usually men of legendary status. Each such structure is the embodiment, symbolically and literally, of the ancestor it represents and all his mythical and real descendants. In other words, one's *whakapapa*, or genealogy—from which a Maori draws his or her identity and *mauri* (ethos)—is embodied in these special houses. By selling Ruatepupuke Romio had in effect pawned his own forebears, thus relinquishing his family sense of *turangawaewae* (the right to belong).

The carved head on the front apex of the roof of a meetinghouse is said to be the ancestor's head. The roof boards along the front are his open, welcoming arms. The doorway is his mouth. The *tahuhu* (ridgepole) is his spine; its length from front to back represents one's life journey from birth to death. The *heke* (rafters) are his ribs. The spacious interior of the house is the ancestor's belly, and the central *potokomanawa* post is his heart.

Carved into stylized faces, with luminescent paua (abalone) shells for eyes, are *poupou*, the upright boards that line the inside walls. These panels represent more recent ancestors, or those of other tribes to whom visitors can relate. A meetinghouse represents a family's ancestors in more than name and form. In fact, it is standard practice for a speech delivered on the *marae* (the ceremonial courtyard immediately in front of the meetinghouse) of a local community to begin with words addressed to the meetinghouse, before the human audience is greeted.

It is known that there have been three houses named after the ancestor Ruatepupuke. According to local account, Ruatepupuke was the legendary figure who obtained the art of wood carving for all Maori from the sea god Tangaroa. The first house built at Tokomaru Bay in memory of Ruatepupuke was dismantled and buried by the villagers during a tribal raid around 1828.

Koromiria Ngawehenga, whose initials appear on the carved and painted roof boards, may have crafted Ruatepupuke II, the one sold by Romio.[2] Then, in 1934, descendants of the family Te O Ruatapare built Ruatepupke III, a large meetinghouse with a modern dining hall, in use today at Tokomaru Bay.

Among the Maori who came to Chicago last year for the Te Maori ceremonies were two Tokomaru elders, Mr. Taiawhio Pewhairangi and Mrs. Iranui Haig. Some years after her great-uncle sold Ruatepupuke II, it became the responsibility of Haig (also known as "Auntie Ada") to keep the family peace. As a child, her grandfather appointed her to heal the wound. She always took the outcast's hand at family gatherings, while the others shunned him.[3]

Just weeks after the opening of the Te Maori exhibit in Chicago, the 19 representatives of the Museum left for New Zealand. Welcomed as guests to four active *marae* and a Maori dairy farm, among other activities, the tour group gained an appreciation for the significance of Maori family networks in maintaining their cultural identity, in fostering social activities, and in managing financial affairs. Tour participant Irene Schultz later made observations on the Maori family system:

We were so taken with the receptiveness they [the Maori] showed to us, to their own families and extended families.... All the family participates in activities. You would be introduced to someone like this: 'Meet my niece's husband's brother's boy.' We might not even know that person in our own family. But they include everybody. They are loving and they lean on each other.

Jim Littlejohn, another tour member, recalls meeting Maori Joe Malcolm, a man who had many children but whose two brothers had none. Malcolm gave each brother one of his own children. All the children live and play near each other and receive much attention from parents and adoptive parents alike.

While visiting each *marae*, tour members observed this same closeness, which in turn affected their own experiences in New Zealand. "Since we were perceived and welcomed by the Maori as one unit, representative of both Field Museum and the United States, we came to see ourselves that way and as individuals with possibly conflicting interests," observes Barbara Ballard.

Don and Dorothy Cameron add:

Some of the families so appreciated our visits, because seldom before had pakehas [New Zealand British or other Westerners] sought them out as friends, rather than as a tourist attraction. Our trip was historically significant because we made a commitment to them, to restore this house, and to help increase the world's understanding of them.

Was it only the hospitality at each *marae* that made the tour group feel like part of the family? "No," says Mr. Cameron. "There is a specific, traditional ceremony of induction, called a *hui*, which means simply 'a gathering.' A village would honor a visiting tribe by 'adopting' it into the Maori community. We went through several of these *hui*, and began to feel included ourselves—as the Family of Ruatepupuke."

Clearly, the highlight of the trip was the visit to Tokomaru Bay. Located on the east coast of New Zealand's North Island, "Toko" is a small village seldom sought out by *pakehas*. Most villagers are of both Maori and *pakeha* descent. Although they lead typically western-type lifestyles, their outlook is vitally Maori, as the tour members learned when they and their hosts embraced each other's offers of friendship.

Here in Tokomaru began the next step in investigating the history and provenience of the Museum's meetinghouse. Dr. Terrell and the tour members hoped to establish beyond a doubt that this was where Ruatepupuke II had once stood. Community leaders Phil and Doris Aspinall, Auntie Ada, and others had always believed that the house at the Field was their *whare hui* (meetinghouse), but they, too, welcomed further proof.

For years there had been confusion at Field Museum about its original location as well. When Umlauff bought the house 85 years ago, it came with a manuscript written by Romio that referred to a meetinghouse called *Huiteananui*. However, as Maori scholar Dr. Sidney Mead recently has pointed out, Huiteananui is really the name of the mythological "first" carved house owned by the sea god Tangaroa.[4]

To compound this confusion, New Zealand scholar W.J. Phillipps, in 1944, identified the house at Field Museum as one from Tolaga Bay, not Tokomaru Bay, 17 miles distant.[5] An 1880s photo accompanying Phillipps' article, however, shows conclusively that Ruatepupuke II is indeed from Tokomaru Bay: the horizon contour to the left of the house roof is clearly that of the foothills behind the village (compare the photos reproduced here).

The Museum group also participated in a meeting with Maori elders one night at Tokomaru Bay, described here by tour member Delbert Yarnell:

Some of the Maori said to us, 'Why should we help your museum restore our house? It was sold irresponsibly to pakehas and it should never have left our people. In fact, we

Visual proof that Field Museum's Maori meetinghouse originated at Tokomaru Bay: The skyline at the left of the photo above, taken in the 1880s, is identical to that in a recent photo (below) taken at Tokomaru Bay. The building is the Field Museum's Maori meetinghouse as it appeared more than a century ago. 109613

John Terrell A110421

should try to retrieve it—it is the house of our ancestry.' Our group just listened, tongue-tied. We weren't expecting this reaction from these people who were otherwise so gracious to us.

Then another elder remarked, 'Well, the house is just not coming back to us, so there's no point in discussing that. The question is what can we all do about the house?' At that point, John Terrell spoke up and said that Ruatepupuke and the trip meant a great deal to him and to us, and that the Museum will safeguard and respect the house on behalf of the Maori people.

Following this accord between the Tokomaru Bay Maori and their American visitors, the tour group returned to Chicago with many ideas about Ruatepupuke and about "what it means to be a Maori," or to be from any other culture, for that matter.

Tour member Jack MacDonald has observed that the trip provoked the members to question their notions about nonwestern peoples and their art once the Chicagoans had learned firsthand about Maori traditions and crafts that are firmly rooted in the past but are attuned to the needs of modern life.

Other preconceptions that were challenged by the journey to the land of the Maori concerned the idea of "family." Does family necessarily mean a nuclear unit, or can it also refer to extended kin? Or even to a network of unrelated individuals, separated by an ocean, perhaps, but bonded by mutual commitment? In this

Tokomaru Bay Maoris greet their American friends in Maori style. A110422

latter sense, the tour group has become a part of the *whakapapa* (genealogy) of Ruatepupuke.

Inspired by their glimpse of the Maori gotten during their "anthropological fieldwork experience," the Chicago branch of the Family of Ruatepupuke has stayed together for over a year now, meeting at one another's homes and at the Museum. On behalf of the group's members, their leader Don Cameron and secretary Barbara Ballard keep in touch with their Maori friends and with the Museum staff who will design and execute the future restoration of the meetinghouse.

Meanwhile, some mysteries about the house remain unsolved. For instance, there seems to be a missing *poupou* board. (Remember, this is not just any board; it is also a family ancestor. And this ancestor may be missing. I mean this rather seriously.) But, quite by accident, Dr. Terrell recently came upon a *poupou* board on display at Peabody Museum in Salem, Massachusetts. Its style—of the Waiapu school of carving—is identical to that of our house. Further collaboration with the Peabody will establish whether this *poupou* board is the missing ancestral figure.

The journey to New Zealand developed into a "cultural mission" for the tour members. Their research, personal explorations, and relationships with Maori and with each other are just the beginning of a "living marae" at Field Museum. "It is only when a work stays with a people, when it is touched, wept, and talked over. . . that it. . . stays alive," writes Anne Salmond, a New Zealand authority on Maori culture.[6] May Ruatepupuke II engender this feeling of tarangawaewae (belonging) in all its visitors. **FM**

Tory Light was a 1987 summer intern in the Department of Anthropology. She expresses her gratitude to Dr. Robert L. Welsch, research associate in Anthropology, for his advice about ethnographic interviewing.

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Field Museum Joins International Union for the Conservation of Nature and Natural Resources

Field Museum of Natural History has been admitted to membership of IUCN, the International Union for Conservation of Nature and Natural Resources, a union of member states, government agencies, and nongovernmental organizations concerned with the development, promotion, and implementation of scientifically based action towards conservation and sustainable use of the world's living resources. Its mission is to provide international leadership for promoting effective conservation of nature and natural resources.

IUCN is an independent international organization, founded in 1948 at Fontainebleau, France, under the sponsorship of the United Nations Educational, Scientific and Cultural Organization (Unesco) and the Government of France. Its secretariat, now based at Gland, Switzerland, is responsible for developing the program of work for the various IUCN components as approved by members meeting in General Assembly every three years. The work of six commissions (Ecology; Education; Environmental Planning; Environmental Policy, Law and Adminstration; National Parks and Protected Areas; and Species Survival) and various advisory groups is coordinated to support the Union's program and to serve as a network for conservation action around the world.

An Operations Division develops and manages conservation projects, based upon external funding, worldwide in collaboration with partner organizations, and three centers (the Conservation Monitoring Centre; Environmental Law Centre; and Conservation for Development Centre) develop and provide a data base and mechanisms needed for implementing conservation activities. In addition, IUCN provides service for international conventions, such as Ramsar and World Heritage.

With the advice, cooperation, and financial assistance of the United Nations Environment Programme (UNEP) and the World Wide Fund for Nature (WWF), and in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Educational, Scientific and Cultural Organization (Unesco), IUCN was responsible for the preparation of the *World Conservation Strategy* (WCS). Published in 1980, the Strategy provides the principles on which conservation should be based, linking conservation with development.

The WCS defines conservation as "the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations." The major objectives of conservation reflected in the Strategy are:

- ☐ maintenance of essential ecological processes and life-support systems
- ☐ preservation of genetic diversity
- ☐ sustainable utilization of species and ecosystems.

Development is defined in the Strategy as "the modification of the biosphere and the application of human, financial, living and nonliving resources to satisfy human needs and improve the quality of human life." For development to be sustainable, it must take account of social and ecological factors as well as economic ones; of the living and nonliving resource base; and of the long-term as well as short-term advantages and disadvantages of alternative actions.

The IUCN philosophy is also appropriately reflected in the World Charter for Nature, which was adopted by the United Nations General Assembly in 1982.

On becoming a member of IUCN, the Field Museum endorsed the objectives of the Union, as indicated in the statutes, and elaborated in the aforesaid *World Conservation Strategy* and the *World Charter for Nature*.

IUCN's membership currently stands at: 58 states, 122 government agencies, 351 national nongovernmental organizations, 29 international nongovernmental organizations, and 19 affiliates, giving a total of 579 members in 117 countries.

FIELD MUSEUM TOURS

Voyage to Patagonia and Cape Horn

Including the Falklands and the Majestic Fjords of the Southern Andes

Aboard the *Illiria*
March 9 - 19, 1988
Accompanied by Dr. James S. Ashe, Field Museum Zoologist

ITINERARY

Day 1: March 9
USA/Santiago
Depart USA on a regularly scheduled flight to Santiago.

Day 2: March 10
Santiago
Morning arrival in Santiago with transfer to Hotel San Cristobal Sheraton. Balance of the day at leisure. This evening attend a welcome cocktail reception and dinner at a local restaurant.

Day 3: March 11
Santiago
In the morning tour cosmopolitan Santiago, situated at an impressive location below peaks that rise to 18,000 feet. Founded in 1541, Santiago is the nation's modern, bustling capital. Visit the museum of natural history, with its collection of Indian folk art; Santa Lucia Hill, where Santiago was founded; colonial San Francisco Church with its art treasures; and San Cristobal Hill, which affords panoramic views of the city and the Andes Mountains. Afternoon at leisure.

Day 4: March 12
Santiago/Punta Arenas/Embarkation on *"Illiria"*
Morning flight to Punta Arenas, the Patagonian city on the northern shore of the Strait of Magellan. Board the *Illiria* and sail in the afternoon. Cruise westward on the waterway separating the Atlantic from the Pacific Ocean, and continue along the Patagonian coast.

Located between the Andes and the Pacific Ocean, the Pacific coast of Patagonia is one of the most spectacular areas in the world. The countless islands, which create a maze of channels and passages, combined with the grandeur of the ice-capped southern Andes which drop precipitously to the sea, make a ship journey here an unforgettable travel experience.

Day 5: March 13
Bay of Mountains/ Strait of Magellan/Beagle Channel
From Puerto Natales, the *Illiria* will proceed to the Bay of Mountains, a steep fjord, and continue to the Strait of Magellan. This famed waterway, which winds for about 360 miles in widths ranging from 2 to 20 miles, separates the land mass of South America from Tierra del Fuego, an archipelago of the continent's southern tip. Enter the Beagle Channel. Here, the impressive mountains of the Cordillera Darwin rise sharply from the sea to create one of the world's most breathtaking fjords. Explore some of the area's spectacular glaciers by zodiac (rubber boats) including Garibaldi Glacier. If conditions permit, land on brilliant white Alemania Glacier.

Day 6: March 14
Ushuaia/ Tierra del Fuego National Park
Ushuaia, Argentina's center in Tierra del Fuego and the most southerly town in the world, has steep streets leading to the mountains, against which the town is built. Many vantage points in the town offer fine views of the nearby snow-covered peaks, rivers, woods, and waterfalls.

An excursion travels to the Tierra del Fuego National Park, comprised of 154,000 acres of mountains and lakes. The park is home to many species of birds and over 500 types of flowering plants. Enjoy a picnic lunch amidst this breathtaking scenery.

Day 7: March 15
Cape Horn
Early in the morning, reach Cape Horn and, weather permitting, make a landing on this landmark, first rounded in 1616 by the Dutch navigator Willem Cornelius Schouten. Born in Hoorn, Netherlands, Schouten appropriately named the cape after his hometown. Cape Horn, a steep rocky headland on Horn Island, marks the southernmost extremity of South America. Depart Cape Horn and continue cruising toward the Falkland Islands.

Day 8 and Day 9: March 16 and 17
Port Stanley/Carcass Island/ West Point Island, Falkland Islands
In the early afternoon of Day 8, arrive in Port Stanley, the main town of the Falklands. First visited in 1592 by the English navigator Captain John Davis, the Falklands changed hands several times between England, France, and Spain. Since 1832 they have been administered by England (despite Argentina's claim which culminated in 1982), and thus most of the approximately 2,000 inhabitants are exclusively of British descent. In their early history, the islands were stopping-off places for whalers and sealers bound for Antarctica. While in Port Stanley, see the impressive hulks of clipper ships which took refuge in the Falklands. For years, scientists have been attracted to the islands' rich wildlife, which is indeed among the most spectacular in the world. This is due to both the lack of human intrusion and the islands' diverse landscape, which ranges from inland moors, lakes, and mountains, to dramatic coastlines, characterized by abrupt cliffs and rocky beaches. Penguins alone include rockhoppers, magellenic, and king. The tameness of the birds of the Falklands is remarkable and there are over 50 species. Large colonies of sea lions and fur seals are found on the beaches. During our stay in the Falklands, visit the rich wildlife sanctuaries on Carcass and West Point Islands.

Day 10: March 18
At Sea
Spend the day at sea cruising toward the South American continent.

Day 11: March 19
Punta Arenas/USA
Early in the morning, the *Illiria* will enter the Eastern entrance of the Strait of Magellan and wind its way to Punta Arenas. Disembark for a tour of Punta Arenas which includes the Patagonia Institute and the Silesian Museum, with exhibits relating to the region's Indians and animal and bird life. Continue to the airport for the flight to Santiago. Enjoy dinner in Santiago before flying to the USA with arrival early the next morning.

Rates: $2,795 - $4,295 per person (double occupancy) Single cabins are available.
These rates do not include air fare
These rates do include a $200.00 contribution to Field Museum of Natural History.

Optional Extensions:
Pre-Cruise: Rio De Janeiro and Iguassu Falls
Post-Cruise: Easter Island

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

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Illustration by Carl Kock

Jump into the world's largest pair of blue jeans, learn how to eat like a horse (and get away with it!), add inches to your height, and conquer Godzilla.

You can do *all* this and more in our newest, fun-packed exhibit **SIZES!** Jump into Sizes and you and your whole family can explore and learn how all living things have special sizes for special reasons.

FIELD MUSEUM
CHICAGO'S LIVING MUSEUM OF NATURAL HISTORY.

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

December 1987

1988 Calendar

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Paid circulation (mail subscriptions)	24,916	24,088
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I certify that the statements made by me above are correct and complete. *Jimmie W. Croft,* vice president for Finance and Museum Services.

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1988 CALENDAR featuring 'round the seasons in Chicago and nearby: the Indiana Dunes and Michigan's Warren Woods. Both areas are within 90 minutes' drive from downtown Chicago. The cover photo and those for January, February, July and the remaining months were shot in Indiana Dunes State Park or along the railroad right-of-way at its southern edge. The March photo was taken in Chicago's Jackson Park, just south of the Museum of Science and Industry; those for April, May, and June were taken in or near Warren Woods.

Arrangements for custom prints of any of these photos may be made by calling or writing the *Bulletin* office. Additional copies of the calendar are available at $4.00 each, postpaid, from the *Bulletin* office or the Membership Department. Ten copies or more: $3.00 each.

Shooting data: *Cover*—camera: Fujica GSW690 (6×9cm), lens: 65mm f/5.6 at f/32, film: Ektachrome EPR 220 (ISO 64); *January and February*—camera, lens and aperture: same as for cover photo, film: Ektachrome EPN 220 (ISO 100); *March*—camera and lens: same except for aperture: f/5.6, film: EPR 220; *April and May*—camera: Canon T90, lens: Canon FD 35-105 f/3.5-4.5, April film: Kodacolor VRG-100 (ISO 100); May film: Kodachrome 25 (ISO 25); *June*—camera: Fujica GSW690, lens: 65mm f/5.6 at f/32, film: Ektachrome EPR 220; *July*—camera: Canon AE-1 Program, lens: Canon FD 50mm f/1.2, film: Kodacolor VR-100; *August*—camera: Fujica GSW690, lens 65mm f/5.6 at f/32, film: Ektachrome EPN 220; *September, October, November, and December*—camera: Fujica GSW690, lens: 65mm f/5.6 at f/32, September and October film: Ektachrome EPR 220, November and December film: Ektachrome EPN 220.

Dave Walsten photographer

Permanent New Exhibits

☐ *"The Webber Resource Center,"* dedicated to native cultures of the Americas. Formally opened in September.

☐ *"Sizes,"* a fun, family exhibit. Opened October.

Temporary Exhibits

☐ *"Tiffany: 150 Years of Gems and Jewelry."* On view through February 6.

☐ *"The Stuff of Dreams: Native American Dolls."* On view through January 15.

December Events

☐ *"Children Play: Games Around the World."* Participatory activity on Saturdays, Dec. 5, 12, and 19, 1:00-3:00pm.

☐ *"Wintertime Tales."* Storytelling on Dec. 27, 28, 29, and 30.

☐ *"World Music."* A variety of ethnic music performances on weekends.

☐ *"Weekend Programs."* Slide lectures on "Tibet Today and a Faith in Exile" (Dec. 12, 1:30pm) and "Malvina Hoffman: Portraits in Bronze" (Dec. 13, 2:00pm)

All events described here are free with museum admission, no tickets required. Check November *Bulletin* or call 322-8855 for further information.

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January 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
December 1987 M T W T F S 1 2 3 4 5 7 8 9 10 11 12 14 15 16 17 18 19 21 22 23 24 25 26 28 29 30 31	**February** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29				**1** **NEW YEAR'S DAY** (Museum closed) sunrise 7 18am, sunset 4 30pm	**2** sunrise 7 18am, sunset 4 31pm
3 *ull moon* elion (Earth 91,400,005 from Sun) 7 18am, sunset 4 32pm	**4** Quadrantid meteor shower, 40-150 per hr.; max. rate may vary 1-2 days sunrise 7:18am, sunset 4:33pm	**5** sunrise 7 18am, sunset 4 34pm	**6** sunrise 7 18am, sunset 4 35pm	**7** sunrise 7 17am, sunset 4 36pm	**8** sunrise 7 17am, sunset 4 37pm	**9** sunrise 7 17am, sunset 4 38pm
10 7.17am, sunset 4 39pm	**11** sunrise 7 17am, sunset 4:40pm	**12** ◑ *last quarter* sunrise 7 16am, sunset 4 41pm	**13** sunrise 7:16am, sunset 4 42pm	**14** sunrise 7 16am, sunset 4 44pm	**15** sunrise 7 15am, sunset 4 45pm	**16** sunrise 7 15am, sunset 4 46pm
17 se 7 14am, sunset 4 47pm	**18** Martin Luther King's Birthday sunrise 7 14am, sunset 4 48pm	**19** ● *new moon* sunrise 7 13am, sunset 4 50pm	**20** sunrise 7 12am, sunset 4 51pm	**21** sunrise 7 12am, sunset 4 52pm	**22** sunrise 7 12am, sunset 4 53pm	**23** sunrise 7 11am, sunset 4 55pm
24 am, sunset 4 56pm sunrise 7 04am, sunset 5 05pm **31**	**25** ◐ *first quarter* sunrise 7 10am, sunset 4 57pm	**26** sunrise 7 09am, sunset 4 58pm	**27** sunrise 7 08am, sunset 5 00pm	**28** sunrise 7 07am, sunset 5 01pm	**29** sunrise 7 06am, sunset 5 02pm	**30** sunrise 7 05am

Indiana Dunes State Park

February 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 sunrise 7:03am, sunset 5:06pm	**2** Groundhog Day ○ *full moon* sunrise 7:02am, sunset 5:07pm	**3** sunrise 7:01am, sunset 5:09pm	**4** sunrise 7:00am, sunset 5:10pm	**5** sunrise 6:59am, sunset 5:11pm	**6** sunrise 6:58am, sunset 5:13pm
7 sunrise 6:57am, sunset 5:13pm	**8** sunrise 6:55am, sunset 5:14pm	**9** sunrise 6:54am, sunset 5:16pm	**10** ◑ *last quarter* sunrise 6:53am, sunset 5:17pm	**11** sunrise 6:52am, sunset 5:18pm	**12** **LINCOLN'S BIRTHDAY** sunrise 6:50am, sunset 5:19pm	**13** sunrise 6:49am, sunset 5:21pm
14 Valentine's Day sunrise 6:48am, sunset 5:22pm	**15** **PRESIDENTS' DAY** sunrise 6:46am, sunset 5:23pm	**16** sunrise 6:45am, sunset 5:25pm	**17** Chinese New Year ● *new moon* sunrise 6:43am, sunset 5:26pm	**18** sunrise 6:42am, sunset 5:27pm	**19** sunrise 6:41am, sunset 5:28pm	**20** sunrise 6:39am, sunset 5:30pm
21 sunrise 6:38am, sunset 5:31pm	**22** sunrise 6:36am, sunset 5:32pm	**23** sunrise 6:35am, sunset 5:33pm	**24** ◐ *first quarter* sunrise 6:33am, sunset 5:35pm	**25** sunrise 6:31am, sunset 5:36pm	**26** sunrise 6:30am, sunset 5:37pm	**27** sunrise 6:28am, sunset 5:38pm
28 sunset 5:40pm	**29** sunrise 6:25am, sunset 5:41pm					

January

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March

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March 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 sunrise 6:24am, sunset 5:42pm	2 sunrise 6:22am, sunset 5:43pm	3 Purim ○ *full moon* sunrise 6:20am, sunset 5:45pm	4 sunrise 6:19am, sunset 5:46pm	5 sunrise 6:17am, sunset 5:47pm
6 sunrise 6:15am, sunset 5:48pm	7 sunrise 6:14am, sunset 5:49pm	8 sunrise 6:12am, sunset 5:50pm	9 sunrise 6:10am, sunset 5:52pm	10 sunrise 6:10am, sunset 5:53pm	11 ◑ *last quarter* sunrise 6:08am, sunset 5:54pm	12 sunrise 6:06am, sunset 5:55pm
13 sunrise 6:04am, sunset 5:56pm	14 sunrise 6:03am, sunset 5:57pm	15 Ides of March sunrise 6:01am, sunset 5:59pm	16 sunrise 5:59am, sunset 6:00pm	17 St. Patrick's Day ● *new moon* sunrise 5:58am, sunset 6:01pm	18 sunrise 5:56am, sunset 6:01pm	19 sunrise 5:54am, sunset 6:02pm
20 Spring begins sunrise 5:52am, sunset 6:03pm	21 sunrise 5:51am, sunset 6:05pm	22 sunrise 5:49am, sunset 6:06am	23 sunrise 5:47am, sunset 6:07pm	24 ◐ *first quarter* sunrise 5:45am, sunset 6:08pm	25 sunrise 5:44am, sunset 6:09pm	26 sunrise 5:42am, sunset 6:10pm
27 Palm Sunday sunset 6:11pm	28 sunrise 5:39am, sunset 6:12pm	29 sunrise 5:37am, sunset 6:14pm	30 sunrise 5:36am, sunset 6:15pm	31 sunrise 5:34am, sunset 6:16pm		

February

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April

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24	25	26	27	28	29	

April 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
March S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	**May** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	Times for sunrise and sunset are for Chicago, Central Standard Time. For Daylight Savings Time add 1 hour.			**1** Good Friday sunrise 5:33am, sunset 6:17pm	**2** **PASSOVER** ○ *full moon* sunrise 5:31am, sunset 6:18pm
3 **EASTER** Daylight Savings Time begins sunrise 5:29am, sunset 6:18pm	**4** sunrise 5:27am, sunset 6:19pm	**5** sunrise 5:26am, sunset 6:20pm	**6** sunrise 5:24am, sunset 6:22pm	**7** sunrise 5:22am, sunset 6:23pm	**8** sunrise 5:21am, sunset 6:24pm	**9** ◑ *last quarter* sunrise 5:19am, sunset 6:25pm
10 sunrise 5:17am, sunset 6:26pm	**11** sunrise 5:16am, sunset 6:27pm	**12** sunrise 5:14am, sunset 6:28pm	**13** sunrise 5:12am, sunset 6:29pm	**14** sunrise 5:11am, sunset 6:31pm	**15** sunrise 5:09am, sunset 6:32pm	**16** ● *new moon* sunrise 5:08am, sunset 6:33pm
17 sunrise 5:06am, sunset 6:34pm	**18** sunrise 5:04am, sunset 6:35pm	**19** sunrise 5:03am, sunset 6:36pm	**20** sunrise 5:01am, sunset 6:37pm	**21** Lyrid meteor shower, 10-15 per hr.; max. rate may vary 1-2 days sunrise 5:00am, sunset 6:38pm	**22** sunrise 4:58am, sunset 6:40pm	**23** ◐ *first quarter* sunrise 4:57am, sunset 6:41pm
24 [illegible] sunset 6:42pm	**25** sunrise 4:54am, sunset 6:43pm	**26** sunrise 4:52am, sunset 6:44pm	**27** sunrise 4:51am, sunset 6:45pm	**28** sunrise 4:50am, sunset 6:46pm	**29** sunrise 4:48am, sunset 6:47pm	**30** sunrise 4:47am [illegible]

Orchard near Warren Woods, Michigan

May 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 ○ *full moon* sunrise 4:47am, sunset 6:50pm	**2** Field Museum opened 1921 (Grant Park) sunrise 4:45am, sunset 6:51pm	**3** sunrise 4:44am, sunset 6:52pm	**4** Eta Aquarid meteor shower, 10-40 per hr.; max. rate may vary 1-2 days sunrise 4:43am, sunset 6:53pm	**5** sunrise 4:40am, sunset 6:54pm	**6** sunrise 4:39am, sunset 6:55pm	**7** sunrise 4:38am, sunset 6:56pm
8 Mother's Day ◑ *last quarter* sunrise 4:37am, sunset 6:57pm	**9** sunrise 4:37am, sunset 6:58pm	**10** sunrise 4:35am, sunset 6:59pm	**11** sunrise 4:34am, sunset 7:00pm	**12** sunrise 4:33am, sunset 7:02pm	**13** sunrise 4:32am, sunset 7:02pm	**14** sunrise 4:31am, sunset 7:03pm
15 ● *new moon* sunrise 4:30am, sunset 7:04pm	**16** sunrise 4:29am, sunset 7:05pm	**17** sunrise 4:28am, sunset 7:06pm	**18** sunrise 4:27am, sunset 7:07pm	**19** sunrise 4:26am, sunset 7:08pm	**20** sunrise 4:25am, sunset 7:09pm	**21** sunrise 4:25am, sunset 7:10pm
22 sunrise 4:24am, sunset 7:11pm	**23** ◐ *first quarter* sunrise 4:23am, sunset 7:11pm	**24** sunrise 4:19am, sunset 7:17pm	**25** sunrise 4:22am, sunset 7:12pm	**26** sunrise 4:22am, sunset 7:13pm	**27** sunrise 4:21am, sunset 7:14pm	**28** sunrise 4:20am, sunset 7:15pm
29 sunrise 4:20am, sunset 7:16pm	**30** **MEMORIAL DAY** sunrise 4:19am, sunset 7:17pm	**31** ○ *full moon* sunrise 4:18am, sunset 7:18pm		Times for sunrise and sunset are for Chicago, Central Standard Time. For Daylight Savings Time add 1 hour.		

April

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June

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12	13	14	15	16	17	18
19	20	21	22	23	24	
26	27	28	29	30		

June 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Times for sunrise and sunset are for Chicago, Central Standard Time. For Daylight Savings Time add 1 hour.	**1** sunrise 4.18am, sunset 7.19pm	**2** sunrise 4.17am, sunset 7:20pm	**3** sunrise 4:17am, sunset 7:20pm	**4** sunrise 4:16am, sunset 7:21pm
5 sunrise 4.16am, sunset 7:22pm	**6** sunrise 4.16am, sunset 7:22pm	**7** ◑ *last quarter* sunrise 4:16am, sunset 7:23pm	**8** sunrise 4:15am, sunset 7:24pm	**9** sunrise 4.15am, sunset 7.24pm	**10** sunrise 4.15am, sunset 7.25pm	**11** sunrise 4.15am, sunset 7.25pm
12 sunrise 4.15am, sunset 7.26pm	**13** sunrise 4.15am, sunset 7.26pm	**14** Flag Day ● *new moon* sunrise 4.15am, sunset 7.27pm	**15** sunrise 4.15am, sunset 7:27pm	**16** sunrise 4.15am, sunset 7:27pm	**17** sunrise 4.15am, sunset 7.28pm	**18** sunrise 4.15am, sunset 7.28pm
19 Father's Day sunrise 4.15am, sunset 7.28pm	**20** Summer begins sunrise 4.15am, sunset 7:28pm	**21** sunrise 4:16am, sunset 7.29pm	**22** ◐ *first quarter* sunrise 4.16am, sunset 7:29pm	**23** sunrise 4.16am, sunset 7.29pm	**24** sunrise 4.16am, sunset 7.29pm	**25** sunrise 4.17am, sunset 7.29pm
26 sunrise 4.17am, sunset 7.29pm	**27** sunrise 4:18am, sunset 7.29pm	**28** sunrise 4.18am, sunset 7.29pm	**29** ○ *full moon* sunrise 4.18am, sunset 7.29pm	**30** sunrise 4:19am, sunset 7.29pm		

May

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July

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24	25	26	27	28	29	
31						

July 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
June S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	**August** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	Times for sunrise and sunset are for Chicago, Central Standard Time. For Daylight Savings Time add 1 hour.			**1** sunrise 4:19am, sunset 7:29pm	**2** sunrise 4:20am, sunset 7:28pm
3 sunrise 4:21am, sunset 7:28pm	**4** **INDEPENDENCE DAY** sunrise 4:21am, sunset 7:28pm	**5** Aphelion (Earth 94,512,258 miles from Sun) sunrise 4:22am, sunset 7:28pm	**6** ◑ *last quarter* sunrise 4:22am, sunset 7:27pm	**7** sunrise 4:23am, sunset 7:27pm	**8** sunrise 4:24am, sunset 7:27pm	**9** sunrise 4:24am, sunset 7:26pm
10 sunrise 4:25am, sunset 7:26pm	**11** sunrise 4:26am, sunset 7:25pm	**12** sunrise 4:27am, sunset 7:25pm	**13** ● *new moon* sunrise 4:28am, sunset 7:24pm	**14** sunrise 4:28am, sunset 7:23pm	**15** sunrise 4:29am, sunset 7:23pm	**16** sunrise 4:30am, sunset 7:22pm
17 sunrise 4:31am, sunset 7:21pm	**18** sunrise 4:32am, sunset 7:21pm	**19** sunrise 4:33am, sunset 7:20pm	**20** sunrise 4:34am, sunset 7:19pm	**21** ◐ *first quarter* sunrise 4:34am, sunset 7:17pm	**22** sunrise 4:35am, sunset 7:18pm	**23** sunrise 4:36am, sunset 7:16pm
24 sunrise 4:37am, sunset 7:16pm **31** sunrise 4:44am, sunset 7:09pm	**25** sunrise 4:38am, sunset 7:15pm	**26** sunrise 4:39am, sunset 7:14pm	**27** sunrise 4:40am, sunset 7:13pm	**28** ○ *full moon* sunrise 4:41am, sunset 7:12pm	**29** sunrise 4:42am, sunset 7:11pm	**30** Delta Aquarid meteor sh[illegible] 10-35 per hr.; max [illegible] vary 1-2 days sunrise 4:43am, sunset [illegible]

Indiana Dunes State Park

August 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Times for sunrise and sunset are for Chicago, Central Standard Time. For Daylight Savings Time add 1 hour.	**1** sunrise 4:43am, sunset 7:09pm	**2** sunrise 4:44am, sunset 7:08pm	**3** sunrise 4:45am, sunset 7:07pm	**4** ◑ *last quarter* sunrise 4:46am, sunset 7:05pm	**5** sunrise 4:47am, sunset 7:04pm	**6** sunrise 4:49am, sunset 7:03pm
7 sunrise 4:50am, sunset 7:02pm	**8** sunrise 4:51am, sunset 7:00pm	**9** sunrise 4:52am, sunset 6:59pm	**10** sunrise 4:53am, sunset 6:58pm	**11** Perseid meteor shower, 50-100 per hr.; max. rate may vary 1-2 days sunrise 4:54am, sunset 6:56pm	**12** ● *new moon* sunrise 4:55am, sunset 6:55pm	**13** Islamic New Year (begins at sunset) sunrise 4:55am, sunset 6:54pm
14 sunrise 4:56am, sunset 6:52pm	**15** sunrise 4:57am, sunset 6:51pm	**16** sunrise 4:58am, sunset 6:49pm	**17** sunrise 4:59am, sunset 6:48pm	**18** sunrise 5:00am, sunset 6:46pm	**19** sunrise 5:01am, sunset 6:45pm	**20** ◐ *first quarter* sunrise 5:02am, sunset 6:43pm
21 sunrise 5:03am, sunset 6:42pm	**22** sunrise 5:04am, sunset 6:40pm	**23** sunrise 5:05am, sunset 6:38pm	**24** sunrise 5:07am, sunset 6:37pm	**25** sunrise 5:08am, sunset 6:35pm	**26** sunrise 5:09am, sunset 6:34pm	**27** Lunar eclipse (partial), visible in most of N. Am. ○ *full moon* sunrise 5:10am, sunset 6:32pm
28 [illegible] sunset 6:30pm	**29** sunrise 5:12am, sunset 6:29pm	**30** sunrise 5:13am, sunset 6:27pm	**31** sunrise 5:14am, sunset 6:25pm			

July

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September

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September 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
August S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	**October** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	Times for sunrise and sunset are for Chicago, Central Standard Time. For Daylight Savings Time add 1 hour.		1 sunrise 5:15am, sunset 6:24pm	2 ◑ *last quarter* sunrise 5:16am, sunset 6:22pm	3 sunrise 5:17em, sunset 6:20pm
4 sunrise 5:18em, sunset 6:19pm	5 **LABOR DAY** sunrise 5:19am, sunset 6:17pm	6 sunrise 5:20am, sunset 6:15pm	7 sunrise 5:21am, sunset 6:14pm	8 sunrise 5:22am, sunset 6:13pm	9 sunrise 5:23am, sunset 6:11pm	10 ● *new moon* sunrise 5:25am, sunset 6:09pm
11 sunrise 5:26am, sunset 6:07pm	12 **ROSH HASHANA** sunrise 5:27am, sunset 6:06pm	13 sunrise 5:28am, sunset 6:04pm	14 sunrise 5:29am, sunset 6:02pm	15 sunrise 5:30am, sunset 6:00pm	16 Field Museum founded 1893 sunrise 5:31am, sunset 5:59pm	17 sunrise 5:32am, sunset 5:57pm
18 ◐ *first quarter* sunrise 5:33am, sunset 5:55pm	19 sunrise 5:34am, sunset 5:53pm	20 sunrise 5:35am, sunset 5:52pm	21 **YOM KIPPUR** sunrise 5:36am, sunset 5:50pm	22 Fall begins sunrise 5:37em, sunset 5:48pm	23 Native American Day sunrise 5:38am, sunset 5:46pm	24 sunrise 5:39am, sunset 5:45pm
25 ○ *full moon* sunrise 5:40am, sunset 5:43pm	26 Sept. 26, 27 Mars brightest since 1971—36,000,000 miles away sunrise 5:42am, sunset 5:41pm	27 sunrise 5:43am, sunset 5:39pm	28 sunrise 5:44am, sunset 5:37pm	29 sunrise 5:45am, sunset 5:36pm	30 sunrise 5:46am, sunset 5:34pm	

October 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
September S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	**November** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	Times for sunrise and sunset are for Chicago, Central Standard Time. For Daylight Savings Time add 1 hour.				**1** sunrise 5:47em, sunset 5:32pm
2 ◑ *last quarter* sunrise 5 48am, sunset 5:31pm	**3** sunrise 5:49am, sunset 5:29pm	**4** sunrise 5:50am, sunset 5:27pm	**5** sunrise 5:51am, sunset 5:25pm	**6** sunrise 5 53am, sunset 5:24pm	**7** sunrise 5:54am, sunset 5 22pm	**8** sunrise 5 55am, sunset 5 20pm
9 Draconid meteor shower, 10 per hr.; max. rate may vary 1-2 days sunrise 5.56am, sunset 5 19pm	**10** Columbus Day ● *new moon* sunrise 5 57am, sunset 5 17pm	**11** sunrise 5 58am, sunset 5:15pm	**12** sunrise 5:58am, sunset 5.14pm	**13** sunrise 5:59am, sunset 5:12pm	**14** sunrise 6.01am, sunset 5 10pm	**15** sunrise 6 02am, sunset 5 09pm
16 sunrise 6 03am, sunset 5 07pm	**17** sunrise 6 04am, sunset 5 06pm	**18** ◐ *first quarter* sunrise 6 05am, sunset 5 04pm	**19** sunrise 6 06am, sunset 5 02pm	**20** Orionid meteor shower, 10-70 per hr.; max. rate may vary 1-2 days sunrise 6.08am, sunset 5 01pm	**21** sunrise 6 09am, sunset 4 59pm	**22** sunrise 6 10am, sunset 4 58pm
23 sunrise 6 11am, sunset 4 56pm sunrise 6 20am, sunset 4 47pm Daylight Savings Time ends **30**	**24** ○ *full moon* sunrise 6 12am, sunset 4 55pm sunrise 6 21am, sunset 4 45pm Halloween **31**	**25** sunrise 6 14am, sunset 4 54pm	**26** sunrise 6 15am, sunset 4 52pm	**27** sunrise 6 16am, sunset 4 51pm	**28** sunrise 6 17am, sunset 4 49pm	**29** sunrise 6 19am, sunset

November 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 ◑ *last quarter* sunrise 6:22am, sunset 4:44pm	**2** sunrise 6:24am, sunset 4:43pm	**3** sunrise 6:25am, sunset 4:41pm	**4** sunrise 6:26am, sunset 4:40pm	**5** sunrise 6:27am, sunset 4:39pm
6 sunrise 6:29am, sunset 4:39pm	**7** sunrise 6:30am, sunset 4:38pm	**8** General Election Day sunrise 6:31am, sunset 4:37pm	**9** Taurid meteor shower, 5-15 per hr.; max. rate may vary 1-2 days ● *new moon* sunrise 6:32am, sunset 4:35pm	**10** sunrise 6:34am, sunset 4:34pm	**11** Veteran's Day sunrise 6:35am, sunset 4:33pm	**12** sunrise 6:36am, sunset 4:32pm
13 sunrise 6:37am, sunset 4:31pm	**14** sunrise 6:39am, sunset 4:30pm	**15** sunrise 6:40am, sunset 4:30pm	**16** Leonid meteor shower, 5-20 per hr.; max. rate may vary 1-2 days ◐ *first quarter* sunrise 6:41am, sunset 4:29pm	**17** sunrise 6:42am, sunset 4:28pm	**18** sunrise 6:43am, sunset 4:27pm	**19** sunrise 6:45am, sunset 4:26pm
20 sunrise 6:46am, sunset 4:26pm	**21** sunrise 6:47am, sunset 4:25pm	**22** sunrise 6:48am, sunset 4:24pm	**23** ○ *full moon* sunrise 6:50am, sunset 4:24pm	**24** **THANKSGIVING** (Museum closed) sunrise 6:51am, sunset 4:23pm	**25** Andromedid meteor shower, 10 per hr.; max. rate may vary 1-2 days sunrise 6:51am, sunset 4:22pm	**26** sunrise 6:52am, sunset 4:22pm
27 sunrise 6:53am, sunset 4:21pm	**28** sunrise 6:54am, sunset 4:21pm	**29** sunrise 6:55am, sunset 4:21pm	**30** sunrise 6:56am, sunset 4:20pm			

October

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December

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25	26	27	28	29	30	

December 1988

Field Museum of Natural History

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
November S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	**January 1989** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			**1** ◑ *last quarter* sunrise 6:58am, sunset 4:20pm	**2** sunrise 6:59am, sunset 4:20pm	**3** sunrise 7:00am, sunset 4:19pm
4 **HANUKKAH** sunrise 7:01am, sunset 4:19pm	**5** sunrise 7:02am, sunset 4:19pm	**6** sunrise 7:03am, sunset 4:19pm	**7** sunrise 7:04am, sunset 4:19pm	**8** sunrise 7:05am, sunset 4:19pm	**9** ● *new moon* sunrise 7:05am, sunset 4:19pm	**10** sunrise 7:06am, sunset 4:19pm
11 sunrise 7:07am, sunset 4:19pm	**12** sunrise 7:08am, sunset 4:19pm	**13** Geminid meteor shower, 50-80 per hr.; max. rate may vary 1-2 days sunrise 7:09am, sunset 4:19pm	**14** sunrise 7:10am, sunset 4:19pm	**15** sunrise 7:10am, sunset 4:19pm	**16** ◐ *first quarter* sunrise 7:11am, sunset 4:20pm	**17** sunrise 7:12am, sunset 4:20pm
18 sunrise 7:12am, sunset 4:20pm	**19** sunrise 7:12am, sunset 4:20pm	**20** sunrise 7:13am, sunset 4:21pm	**21** Winter begins sunrise 7:14am, sunset 4:22pm	**22** Ursid meteor shower, 10-15 per hr.; max. rate may vary 1-2 days sunrise 7:15am, sunset 4:22pm	**23** ○ *full moon* sunrise 7:15am, sunset 4:23pm	**24** sunrise 7:15am, sunset 4:23pm
25 **CHRISTMAS** (Museum closed) sunrise 7:16am, sunset 4:24pm	**26** sunrise 7:16am, sunset 4:24pm	**27** sunrise 7:17am, sunset 4:25pm	**28** sunrise 7:17am, sunset 4:26pm	**29** sunrise 7:17am, sunset 4:27pm	**30** ◑ *last quarter* sunrise 7:17am, sunset 4:27pm	**31** sunrise 7:17am, sunset 4:28pm

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

Illustration by Carl Kock

Jump into the world's largest pair of blue jeans, learn how to eat like a horse (and get away with it!), add inches to your height, and conquer Godzilla.

You can do *all* this and more in our newest, fun-packed exhibit **SIZES!** Jump into Sizes and you and your whole family can explore and learn how all living things have special sizes for special reasons.

FIELD MUSEUM

CHICAGO'S LIVING MUSEUM OF NATURAL HISTORY.